Lack Of Adoption Of Electronic Medical Records Systems In Developing countries: A Case Study Of Zimbabwe

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By

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ABSTRACT

This study explored the phenomenon of electronic medical records systems in Zimbabwean primary healthcare institutions. The goal of the study was to investigate the lack of adoption of electronic medical records systems by primary healthcare institutions in developing countries using an interpretative case study approach focusing on the Zimbabwean context. Despite the positive benefits that are associated with EMRs, developing countries have been reluctant in implementing this technology within their primary healthcare institutions. A number of studies have been conducted on EMR systems but only a few have investigated the reasons for the limited use of EMR technology in developing countries particularly within the Zimbabwean context. This study primarily adopted a case study approach and was qualitative in nature. The study made use of in-depth interviews to obtain its data, and purposive sampling method was used to identify participants for the study. The study made use of a sample size of fourteen respondents who were identified based on their knowledge and could assist explore this particular topic relevant to the research. The targeted population for this research were key staff members privy to patients' medical records management within the primary healthcare facilities. The data collected was analysed using thematic analysis soon after the transcription process.

The results of the study show that EMRs technology in Zimbabwe has been implemented on a limited scale within its public hospitals. The technology is being used mostly in HIV/AIDS management or in particular departments. The study reveals that although healthcare institutions in Zimbabwe have adopted EMRs technology, most of the information is still being archived on the paper based system. The findings of the study show that Zimbabwe hasn't adopted EMRs due to challenges such as lack of proper infrastructures, resistance in the use of EMRs, remoteness, shortages in skilled labour and concerns of confidentiality and privacy. Furthermore, the study shows that though the application of the EMR system is limited in Zimbabwean hospitals, the study found that its benefits have been noticeable. EMR technology has made it easy to access information, averted redundant expenditure and has made time improvements. However, the study revealed that EMR systems come with their own shortcomings such as lack of access to patient documents due to network faults and the need for familiarity with computer systems.

Keywords: Adoption, DOI, EHRS, EMRs, Implementation, Information, Infrastructure, Healthcare, MoHCC, TOE, Zimbabwe.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER ONE

INTRODUCTION

1.1 Introduction

Electronic Medical Records System (EMRs) is a systematic repository of computerised health information on individual patients or populations. The World Health Organisation (WHO,2006) defines EMRs as "*a record in digital format that is capable of being shared across different healthcare settings, by being embedded in network-connected enterprise-wide information systems*". The adoption and implementation of Electronic Medical Records (EMRs) has the potential of offering substantial benefits to doctors, nurses, patients and governments at large. They can improve workflow and enhance patient safety, increase efficiency and improve quality of patient care (Ludwick and Doucette, 2009; Menachemi and Brooks, 2006; Nguyen, Bellucci, and Nguyen, 2014). Among other benefits, EMRs are known for cost and time saving(Iqbal et al., 2013); and improved access to information on preventable diseases (King, Patel, Jamoom, and Furukawa, 2014). The adoption and implementation of EMRs is believed to bring with it time and cost saving benefits (Lim et al., 2015). Despite these benefits, few studies have examined the adoption and use of EMRs in developing countries, specifically those on the African continent. On a continent afflicted by a wide variety of health related challenges, the need to implement EMRs structures so as to improve and strengthen the overall healthcare systems is therefore critical (Vital Wave Consulting, 2009). Hence, it is imperative for more studies of this nature to be conducted in African countries in order to highlight the fundamental benefits of implementing EMRs technology.

Against this background, this study examines the EMRs phenomenon in the context of Zimbabwe where the utilisation of Information and Communication Technology (ICT) in healthcare delivery by primary healthcare institutions is still a novelty. Although most private healthcare institutions, such as The Avenues Clinic (Matavire, 2016) and West End Hospital (Ministry of Health and Child Welfare, 2012) have adopted EMRs and are reaping the perceived benefits; public institutions still lag behind.

As of December 2012, there has not been any primary healthcare institution countrywide to have fully adopted an EMRs (Ministry of Health and Child Welfare, 2012). The public institution's lack of adoption of EMRs could potentially have an adverse effect on the healthcare delivery in the country. Paper based systems have negative consequences such as incompletely filled paper charts, difficult to decipher handwriting, and missing notes which prevent doctors and nurses from accessing important patient information which influences the quality of care given to patients (Ohuabunwa, Sun, Jubanyik and Wallis, 2015). Paper based records also have a risk of misdiagnosing patients due to lack of adequate historical information and can have devastating health implications which may lead to loss of lives (Weeks, 2013). Manually recording laboratory results may give the wrong diagnosis of a patient's condition leading to life threatening implications. On this note, the purpose of this study is to explore the lack of adoption of Electronic Medical Records (EMRs) by primary healthcare institutions in Zimbabwe.

1.2 Problem Statement and Definition

Research conducted on the EMRs phenomenon in the context of developing countries still remains obscure and limited. As for those that have adopted EMRs technology their use remains limited to specific departments such as HIV/AIDS management (Ohuabunwa et al., 2015; Mamatela, 2014; Lustria, Smith and Hinnant, 2011; Sood et al., 2008). However, it is not clear what factors hamper the full adoption of EMR technology in Zimbabwean healthcare facilities, understanding these factors can best assist the government in finding ways overcome the obstacles. This identified gap in literature –that of limited studies identifying factors that hamper the adoption of EMRs within healthcare institutions in Zimbabwe– establishes the main research problem of the study. The majority of studies on the adoption of EMRs technology have focused on both developed and developing countries such as South Africa, Nigeria, Kenya, India, USA, Canada (Ohuabunwa, et al., 2015; Weeks, 2013; Xue et al., 2012; Sood et al., 2008).

1.3 Goals and Objectives of the study

The goal of this study is to investigate the lack of adoption of Electronic Medical Records Systems by primary healthcare institutions in developing countries with a particular focus on Zimbabwe.

Research Objectives

The objectives of the study were:

- To understand the perceptions that healthcare professionals have on EMRs.
- To investigate the current state of EMRs adoption by the primary healthcare institutions in Zimbabwe.
- To explore the challenges hampering the adoption of EMRs in Zimbabwe.

1.4 Research Questions

The study is guided by the primary research question: “What factors contribute to the lack of adoption of Electronic Medical Records (EMRs) by primary healthcare institutions in Zimbabwe?”

1. What perceptions do healthcare professionals have on EMRs?
2. What is the current state of EMRs adoption by the primary healthcare institutions in Zimbabwe?
3. What are the challenges hampering the adoption of EMRs in Zimbabwe?

1.5 Theoretical Framework

This study utilised the Diffusion of Innovations Theory (DOI) and Technology-Organization-Environment (TOE) theories as a guiding lens to understand the lack of adoption of EMRs by primary healthcare institutions. Rogers (2003) believes that healthcare institutions are only able to make informed decisions based on the received information, the moment innovation is communicated to individuals within the organisation. The way the information is interpreted contributes to the collective adoption decision of the innovation (Rogers, 2003). The application of both the DOI and TOE theories allowed the researcher to gain a more holistic approach to EMR adoption within Zimbabwean Hospitals.

According to the DOI theory the diffusion of innovation relies on the basis of two factors which are: the characteristics of the technology, and users' perceptions of the system. Whereas the TOE framework puts forward the notion that adoption of EMR technology is influenced by technological, organisational and environmental contexts. Combining the two theories thus provides a more complete and integrated explanation of intra-healthcare institution innovation adoption. The combination of the two aids in predicting the adoption decisions based on factors that are related to the technology itself (such as the characteristics of the technology, and the users' perception about the technology). Therefore combining the TOE framework and the DOI theory will help in understanding the adoption of electronic medical records systems by the primary healthcare sector in Zimbabwe.

1.6 Research Methodology

Due to a limited number of studies conducted on EMRs technology within the Zimbabwean context, the research design for this research consisted of an exploratory study for the lack of adoption of EMRs by primary healthcare institutions. To address the above research questions, the study followed the interpretive stance while using a qualitative approach in the form of a case study research design. The study utilised in-depth interviews as a data collection instrument. The study included a three-month field study at three different departments, in two provincial hospitals in Zimbabwe. The targeted population were key staff members privy to patients' medical records management within the primary healthcare facilities. The data was analysed using thematic analysis soon after the transcription process. A more detailed description of the research method employed is given in chapter four.

1.7 Significance of the study

In respect to theoretical importance, the study adds on existing literature on the subject of Electronic Medical Records (EMRs) in developing countries. As previously noted, there is not much literature available on the adoption and implementation of EMRs by primary healthcare institutions in Zimbabwe. Furthermore, this research could serve as a basis for further studies in the adoption and implementation of EMRs and associated technologies in the healthcare sectors of developing countries. Empirically, this study can work as an advocacy tool for the full adoption and implementation of EMRs in the Zimbabwean Ministry of Health and Child Care.

1.8 Outline of the Study

Chapter 1: Provides a general introduction to the study, research questions, importance of the study and the research method, as well as an outline of the chapters in the study.

Chapter 2: Reviews literature on Electronic Medical Records.

Chapter 3: Provides the theoretical framework of the study on which the research is anchored looking at both the rationale for the choice of framework and its theoretical gaps.

Chapter 4: Outlines the research design and methodology. Scope of the study, consisting of the study area, target population and sampling technique.

Chapter 5: Discusses the findings of the research, explain the meaning of the findings in relation to each of the research hypotheses and the possible implications of the findings.

Chapter 6: Contains the recommendations and conclusions drawn from the findings of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter gives a review of the literature relating to Electronic Medical Records (EMRs). As a point of departure, the first section of this chapter will focus on understanding what Electronic Medical Records Systems (EMRs) are, their functions, their perceived benefits as well as the unintended consequences associated with their use. The chapter will also review the state of EMRs within healthcare institutions across the world. Lastly, the chapter reviews the literature on challenges encountered in the implementation of EMRs in developing countries.

2.2 What are EMRs?

Ohuabunwa, Sun, Jubanyik and Wallis (2015) defined EMRs as longitudinal patient records which are in electronic form that contain information created from previous encounters in any healthcare delivery settings which includes information such as a patient demographic information, notes for the patient's, medical history and so on. While Ludwick and Doucette (2009) define EMRs as a health information system that is computerized where providers record detailed encounter information such as patient demographics, encounter summaries, medical history, allergies, intolerances, and lab test histories. In simple terms EMRs are computerized systems that store patients' health information (Banshanga and Ejiri, 2016). In this study EMR systems are defined as the personal health information of patients that is recorded in an electronic format by healthcare workers during an individual's visit to a healthcare setting. From the above definitions, EMRs are perceived as a vital tool that enables clinicians to communicate and exchange information which in turn may reduce patients' waiting time through a healthcare system and knowledge gaps of patients, across healthcare providers.

2.3 Benefits of using EMRs

The popularity of EMRs has soared in more developed countries because of its many benefits (Ohuabunwa et al., 2015). Were et al. (2010) affirm that the vital role played by EMRs in improving care has been proven in developed countries were they assist in the storing, organization and presentation of data. EMR systems are intended to provide a variety of benefits such as better decision support, improved access to information, financial and time improvements, as well as patient monitoring improvements. These are briefly explained below.

2.3.1 Decision Support

The use of EMR at healthcare institutions assists in influencing clinical outcomes through the improvement of quality of care, safety, efficiency and minimizing medical errors (Ohuabunwa et al., 2015). Meinert (2005) positions that with the complicated medical conditions or occasions when a patient has been treated by different practitioners, it is difficult for either the patient or physician to remember the medication, allergy and problem documentation. The decision support functionality permits medical personnel to take better decisions when treating patients (Hatton et al., 2014). Knowledge such as drug allergies as well as drug-drug interactions are provided in order to enable practitioners to make better informed decisions as well as reminders that aid with patient monitoring (Hogan and Kissam, 2010). EMR systems enable the capturing, processing and viewing of all the details related to a patient's medical encounter (Miller and Sim, 2004). This collection of administrative and medical information resembles or is an electronic version of a paper-based patient file. EMRs provide users with information that supports their decision making and allows them to make better informed decisions (Hogan and Kissam, 2010). Some examples include warnings given by the system when a user attempts to prescribe a drug that a patient is allergic to, warnings against incompatible drugs, and reminders that assist the user to efficiently monitor patients (Hogan and Kissam, 2010).

2.3.2 Access to Information

The use of EMRs provides access to patient information that is accurate, legible and organised which can be easily retrieved (Miller and Sim, 2004). They affect societal outcomes by facilitating research, promoting population health by making it easier to monitor diseases, and increase job satisfaction among physicians. Thus efficient documentation enables access to patient information. This can further translate into improved patient care (Hatton et al., 2012). EMRs allow for the exchange of information between physicians and/or hospital departments. EMRs also enable users to communicate through messaging (Miller and Sim, 2004).

2.3.3 Financial Improvements

Ohuabunwa et al. (2015) argue that EMRs benefit healthcare institutions as they affect the administrative outcomes through the increase of revenue, reducing the expense of unnecessary tests and medications and lessening their legal vulnerability. By efficiently keeping track of the services that have been rendered to patients and capturing the charges accordingly, EMRs can help with cost savings and revenue increases (Hatton et al., 2012). EMRs may also be integrated with billing systems so as to improve the billing of patients and lead to financial benefits (Miller and Sim, 2004). EMRs also allow for the identification of patients in need of care through data mining thereby increasing revenue (Hatton et al., 2012).

2.3.4 Time Improvements

Through improved communication and access to information, EMRs enable practitioners to save time and therefore provide care to patients timeously (Hatton et al., 2012). Since time is probably the physician's most precious asset, the EMR system makes it faster to compile clinical documents by producing a complete record of the patient hospital visits in the most time-efficient way possible (Gerntholtz et al., 2007). Where practitioners would have had to use scribbled notes to communicate, or physically retrieve hard copy patient files they are able to do this electronically, saving valuable time (Miller and Sim, 2004). Meinert (2005) states that the application of an EMR system minimizes the need for unnecessary collection of data as well as allowing healthcare professionals to review family history faster and make updates where necessary. EMRs allow for the electronic ordering of prescriptions, referrals, laboratory

and radiology tests (Miller and Sim, 2004). More advanced systems allow the progress of the orders to be tracked (Miller and Sim, 2004).

2.3.5 Patient Monitoring Improvements

Through the use of reminders, warnings, reports and decision support, EMRs improve the efficiency with which patients are monitored (Hogan and Kissam, 2010). These features also allow for better disease prevention and management (Lenhart et al., 2000). Adoption and implementations of EMRs in the studies have alluded numerous merits for physicians, managers and patients. Benefits include for instance, records of drug usage, diseases, diagnosis tests which might help to improve quality and continuity of care, health policy, patient safety and medical research (Kaliyadan, et al., 2009). (Rotich, et al., (2003) believes that EMR assist in assessing the adherence of patients to medication prescribed by the physician. In addition, the use of EMR technology restructures the data system which improves the time needed to retrieve patient information (Forster, et al., 2008). Similarly, Aaronson et al. (2001) concurs by noting that EMRs reduce the amount of time needed to go through patient's medical history and consultation time which shortened patient on-boarding process. EMRs systems have been commended for bettering healthcare delivery and improved patient care (Tu et al., 2011).

2.3.6 Reporting

According to Kleynhans (2011), the EMRs reporting application offers users with prepared reports of the health status of patients. Physicians and other healthcare personnel can obtain important reports summarising information about patient's health events and health status which will be more advantageous in emergency situations (Kleynhans, 2011)**.** The reports that are produced assist healthcare establishments and governments in crucial moments of decision making (Hogan and Kissam, 2010). Tu et al. (2011) provides an example where EMRs can be used to produce a report to identify diabetic patients. Rotich et al (2003) states that reporting improves data management which in turn enhances treatment turnaround times. This allows physicians more time for consultations and patients examinations, thus patient satisfaction and quality of diagnosis and examination may be achieved (Tierney, 2002).

2.4 Disadvantages of using EMRs

Unfortunately, there are unintended or unanticipated consequences that come about as a result of EMR use. Listed below are some of the unintended consequences that may result from the use of EMR.

2.4.1 Communication with Patients

According to Kleynhans (2011), the use of EMR systems permit patients to communicate with the whole healthcare service by way of web portals. This offers a framework for communication connecting patients with healthcare personnel or between physicians themselves (Kleynhans, 2011). However, Katsande (2015) opines that EMRs systems actually impair communication between physicians and their patients in some instances. He proceeds to state that the fixed position of computers limits the degree to which a general practitioner can move around so as to be positioned appropriately towards the patient.

2.4.2 Data capturing

Data capturing is one of the main disadvantages while using EMRs in certain instances. Katsande (2015) mentions that EMRs users have raised concerns on the challenges they encounter when capturing data. This is because EMRs systems are more complicated in data capturing when compared to paper based systems. Most practitioners prefer capturing data at the bedside as they find it to be more convenient, but system setup and terminal locations may not cater for this (Moody et al. 2004). EMR systems can have negative impacts in patient care in instances where time is wasted while trying to capture data (Ayatollahi, Bath and Goodacre, 2010).

2.4.3 Security and privacy issues

The issue of security and the protection of data is an important aspect that needs serious attention as healthcare staff need to adhere to a code of ethics to safeguard the security of patient information (Kleynhans, 2011). EMRs contain patients' private and confidential information which should be always be protected from unauthorised access. EMR systems that are currently in use do not have protection at all or they are simply encrypted in bulk (Akinyele et al., 2011). This means that patients' information

is at high risk of being accessed by unauthorised individuals. Akinyele et al. (2011) argues that when records are sent out to other different institutions they are simply protected by transport level protocols only. Akamai (2015) contends that this can have devastating consequences as information found in EMRs documents also gives criminals an opportunity to perpetrate more elaborate financial identity theft. Criminals can obtain loans, credit cards, and bank accounts under the stolen identity (Akamai, 2015).

2.4.4 EMRs can only be accessed online

One of the biggest challenges of EMRs is their need for a proper internet access for them to function. Without internet access, health care personnel cannot access servers or online databases which store patient medical records which could be disastrous in emergency situations (Akinyele et al., 2011). At times network failures means that healthcare workers will need to use a parallel data entry system which increases the workload of over-stretched staff (Akanbi et al., 2011).

2.5 EMRs in Developing countries

According to Ohuabunwa et al. (2015) the use of EMRs is not only limited to developed countries, as many developing countries have recognised the importance of EMRs and have set up technology to fit their needs within known resource constraints. The use of EMR is however limited within developing countries, Ohuabunwa et al. (2015) state that it has been implemented in HIV/AIDS management in South Africa, Kenya, Rwanda, Ghana, Lesotho, Zimbabwe, Mozambique, Sierra Leone, Uganda, and Tanzania. Despite their characterisation as developing countries, some have demonstrated leadership through significant investment in recent generation health information systems.

According to Stone (2014), India’s healthcare system is made up of both private and public hospitals and providers. The country has a total population in excess of one billion citizens living in different cities and villages (Vital Wave Consulting, 2009).

To improve its healthcare sector to cater for its massive population, India has implemented EMRs at community level to increase the tracking of pregnancies, births and deaths which has improved the national records of the country (World Health Organization, 2014). The adoption of EMRs had been significantly low compared to other nations thus the government budgeted $19.2 billion in 2015 to increase its acceptance as well as to influence its returns (Sharma and Aggarwal, 2016). Sharma and Aggarwal (2016) believe that the slow adoption of EMR technology was because it was yet to be mandated in the country.

Similar to India, the penetration of EMRs particularly within Kenyan public hospitals has been low (Wamae, 2015). Though the implementation of EMRs technology in Kenya is still at an infant stage, Juma et al. (2012) states innovative EMRs applications have been applied in HIV/AIDS management. A number of EMR systems are in existence in Kenya which aim to gather and manage patient information, provide analysis of data, assist the making of decisions and to manage external systems (Waithera, Muhia and Songole, 2017). Kenyan private and public healthcare facilities make use of EMR systems such as Comprehensive Patient Application, Database (CPAD), IQ Care, Care 2000, Funsoft, Compact, Open Medical Record System (OpenMRS) (Waithera et al., 2017). EMRs such as AMRS (AMPATH Medical Records System) have been employed to capture data for HIV positive patients (Wamae, 2015). The development of revolutionary softwares such as funsoft, LIMS and Kenya EMR, is an indication of how Kenya has been making significant progress in developing EMRs technology. However, challenges still persist in the implementation of EMRs technology in Kenya. These include lack of infrastructure, shortage of skilled labour, absence of proper a policy and regulatory framework, and limited funding (Waithera, et al., 2017; Chebole, 2015; Juma et al., 2013; Douglas et al., 2010).

On the other hand, Zambia makes use of ZEPRS (Zambia Electronic Perinatal Record System) which is an EMR system designed to gather electronic data for demographic characteristics, patient medical and obstetric records, prenatal and postnatal care at twenty-five public healthcare institutions in Lusaka (Chi et al. 2011). Healthcare workers make use of the ZEPRS application to enter information of every patient who has visited the medical facility (Chi et al. 2011). Another EMRs technology in use is called SmartCare which was developed and deployed to public hospitals in Zambia.

This system is the biggest in Africa and is being used in other countries such as Ethiopia and South Africa (Mweebo, 2014). According to the Ministry of Health Zambia (2013) this system is an integrated EMR system that offers stable care and management of patient data at healthcare institutions as well as the district level. This EMR system is designed in such a way that every Zambian patient is given an electronic card which stores their medical record (Vital Wave Consulting, 2009). This system has been implemented and is operational in approximately 700 healthcare institutions across the country's districts. The use of SmartCare software has brought about a number of benefits such as improved continuity of patient care; improved the confidentiality of sensitive patient data; less paperwork burden on healthcare workers; improved the quality of patient data and decision support (Mweebo, 2014; Vital Wave Consulting, 2009). Challenges to the Smartcare EMRs technology in Zambia include computer down time, threats to confidentiality, lack of connectivity and negative attitudes towards computers (Moomba, 2017; Mweebo, 2014; Chi et al, 2011).

Ethiopia has made strides in implementing EMRs technology by implementing a software called Smart Care which was borrowed from Zambia (Mengesha, 2011). According to Mengesha (2011), the implementation of EMR systems has brought about benefits such as improving the effectiveness of the healthcare delivery and increasing the speed and access to quality health information. In Ethiopia, more than 100 healthcare facilities within the Dire Dawa region have implemented the EMRs technology successfully, which has improved the quality of health information and delivery of care to patients (Mengesha, 2011). Ethiopia's efforts to implement EMRs technology face challenges such as poor existing infrastructure, frequent power outages and network failure.

In 2001, Malawi introduced EMRs technology athough the use of paper-based record systems is still being practiced since they are preferred by some healthcare workers (Msiska, Kumitawa, and Kumwenda, 2017). According to Pantuvo, Raouf and Wichramasinghe (2011), Malawi has implemented a flexible, open source, free software that was designed by the international HISP group for managing patient data in public healthcare institutions called the District Health Information System (DHIS), a reporting tool used to track the state of a country's health system and to collect data required by policy makers for the distribution of recourses. (Akanbi et al., 2011).

Documented benefits of EMRs technology include quick access to patient records; ability to flag abnormal results; elimination of hand written prescriptions; and assisting in making of informed decisions (Msiska, Kumitawa, and Kumwenda, 2017; Akanbi et al., 2011). The major challenges that have been encountered with the use of EMRs technology include staff shortages; lack training for healthcare workers; high cost of set-up and maintenance; poor existing infrastructure, frequent power outages and network failure (Tough and Lihoma, 2017; Msiska, Kumitawa, and Kumwenda, 2017; Akanbi et al., 2011).

In Ghana, the District Health Information Management System (DHIMS), a reporting tool used to track the state of a country's health system and to collect data required by policy makers for the distribution of recourses, is the first attempt in an effort to modernise patient data capturing using EMRs systems. The project was piloted to twenty districts throughout Ghana and was implemented in all district healthcare facilities in 2007 (Achampong, 2012). Patient information captured is despatched to regional Health Administrations where it is analysed then forwarded to the National Health Administration (Abdulai, 2009). The use of EMRs has improved the quality of healthcare in Ghana as well as reducing the number of medical errors and has contributed to a reduction in costs (Da-Costa Vroom et al., 2017). However, a number of challenges have plagued the implementation of EMRs in Ghana and these this include poor human resources, limited funding and lack of coordination in the nature of EMRs deployment (Da-Costa Vroom et al., 2017; Abdulai, 2009).

Whereas in Uganda, evidence shows that EMRs technology is gaining ground within the healthcare area as software such as Careware are widely being used in public hospitals (Banshanga, and Ejiri, 2016). Other EMR systems which are being used in different hospitals include OpenMRS, DHIS2, and mTack (Kiberu, Mars and Scot 2017). The adoption and implementation of EMR systems in Uganda has been low due to barriers such as the shortage of skilled workers; high cost of equipment, limited funding, and difficulty in converting paper-based documents into electronic format (Kiberu et al., 2017; Banshanga, and Ejiri, 2016).

2.5.1 State of EMRs in Zimbabwe

Since the inception of HIV/AIDS prevention programmes in the late 1990’s all patient-related data was collected using manual, paper-based systems. By 2008 the system

in Zimbabwe was not functioning properly due to the increase in the volume of patients requiring treatment, which by 2014 had increased to over 740,000 patients. This increase had affected the accurate monitoring and reporting of patients accessing HIV/AIDS services, as the paper-based patient information systems could not cope. This translated into huge workloads that continued to put a strain on the already over-burdened healthcare workers. To address this gap the Ministry of Health and Child Care, in consultation with its partners, resolved to establish an electronic system to collect and manage HIV/AIDS and TB data at patient level with the aim of phasing out paper registers throughout the country. There have been some reforms in the management of health information recently aimed at improving the quality of health records in Zimbabwe. This has predominantly been in response to donor's agent requests with the most prominent players namely, the UNDP, USAID, Global Fund and the DFIFD. Zimbabwe has also made significant strides towards its commitment to meeting the Millennium Development Goals (MDGs) (Matavire, 2016; Ministry of Health and Child Welfare, 2012; MOHCC, 2012).

Amongst the various interventions in Health Information Management Systems, the United Nations Development Program (UNDP) implemented Maternal and Child Health Information System as the most significant and extensive in primary health care institutions (Matavire, 2016). The project was first piloted between the years 1987-1993 in six out of the ten administrative regions of Zimbabwe, focusing on an organised data collection and reporting at departmental level (Ministry of Health and Child Welfare, 2012). The most recent intervention was by the District Health Information System (DHIS2), which has been attempting to modernise the capturing of health information by use of mobile devices (Matavire, 2016). The MOHCC has however, blamed the low success rate to inadequate human skills, poor infrastructure owing to low levels of investment in ICT, red tape environment and the uncoordinated nature of E-Health deployment as some of the start-up challenges to these interventions (Matavire, 2016). Corrective steps have been taken by the MOHCC to address the human skills challenge through the adoption within the curriculum for doctors and nurses training of an ICT module.

The hope for an equitable and quality healthcare delivery system still remain a mirage in developing countries, particularly in the current face of limited capital and human

resources (Ministry of Health and Child Welfare, 2012). EMR systems have been found to have benefits such as cutting costs, an access to medication history of patients which improves safety, an improvement in the relationship between healthcare workers and patients, and improving the quality given to patients (Sood et al. 2008).

2.6 Challenges in the implementation of EMRs in developing countries

According to Sood et al. (2008), the development of EMR in low income nations is a difficult mission as many elements contribute to the progression and diffusion of such technologies. Though some developing nations have embraced the use of EMRs, it has made a promising start which enables further development of EMRs (Kaliyadan, 2009). Negative drivers have impeded and discouraged the willingness to adopt EMR technology which means its potential benefits are overlooked. This section discusses the various challenges which hinder the implementation of EMRs in developing countries. These include resistance of the use of EMRs by healthcare professionals, lack of funding, brain drain and so forth.

2.6.1 Resistance use of EMRs

Such a transition from a paper-based system to EMR is often seen as a daunting task that appears to be unachievable as the process is complicated and is only achievable if it is compartmentalised into manageable tasks (Hartley, 2010). According to Weeks (2014), this transition requires more than identifying and implementing the necessary technology systems involved as it demands a need to manage the human dimensions of change. This fundamentally is key in assigning the “complex” connotation involved in the change management process (Weeks, 2014). Resistance from physicians and patients in the use of EMRs is generally high in most low income countries. As if that is not enough, the lack of essential skills-force still remains an issue particularly on the quality and quantity of human resources (Forster et al., 2008). This is because brain drain is negatively affecting the number and healthcare personnel remaining to the disposal of developing nations. Despite the apparent complexity and obstacles related to implementing and utilising EMR, it is the best prospect for the future of healthcare (Gelmon and Droppers, 2008). The EMR system allows the users to create medical records in an electronic fashion as well as storing, organizing them, editing and

retrieving them which enhances the healthcare service delivery (Gelmon and Droppers, 2008).

2.6.2 Lack of technical expertise

Lack of technical expertise for technical support is one of the most highlighted topics among studies particularly hardware, software and other equipment malfunctions (Kaliyadan, 2009). Also interruptions in workflow (Forster et al., 2008) as alluded in some studies, like the complex procedure that patients experience in a public healthcare sector, for instance a patient has to go from vital signs stage then consultation, then the laboratory and lastly the pharmacy. However, in developing nations patients usually have a habit of not finishing all the steps and they usually go directly to a room that suits their condition, such actions result in difficulties in collecting all patient information (Kamadieu, et.al, 2005).

2.6.3 Geographical challenges

Other than subjective effects, the disproportional distribution of healthcare facilities geographically may also negatively affect the process of data management. In addition is the major concern in many developing countries of the availability of electricity within the healthcare facility (World Health Organization, 2006). For example, some remote areas encounter problems of inconsistent electricity supply as one of the main factors derailing the adoption and implementation of EMRs on the African continent (Lober et.al, 2008), hence the need to invest in power back-up systems in form of inverters, uninterruptible power supply, solar panels and generators is a requirement. These would be additional costs to already constrained developing economies and will have an impact on decision-making.

2.6.4 Brain drain

The availability of properly trained healthcare workers represents another issue to consider while preparing to introduce an EMR system (World Health Organization, 2006). One of the challenges hindering the development of EMRs in developing

countries is the limited number of well-trained staff in rural areas as a result of healthcare professionals migrating to developed nations searching for better opportunities (Anantraman et.al, 2002). In most low income countries there might be an adequate number of staff but the lack of proper skills may not be enough for the tasks expected of them (World Health Organization, 2006).

2.6.5 Language barriers

Sood et al. (2008) claims that culture particularly the issue of language, is an important factor to consider for the successful development of EMR systems in low income countries. The majority of EMRs installations in developing nations were developed in countries like USA, and the default language is English with no alternative which may inconvenience other users (Tierney et.al, 2002). Language barriers between different cultural subsystems has been a challenge since the majority of EMR systems are developed in English which prevents the transfer of knowledge from one culture to the other (Sood et al., 2008). Countries such as Cameroon has 279 distinct languages while Nigeria has 515 which is a tremendous diversity of languages. Also, language becomes a significant factor in assessing usage of EMR systems in non-English speaking regions where data presented in the users' native language seems to be the most decisive factor for attracting website visitors (Sood et al., 2008).

2.6.6 Issues surrounding confidentiality and privacy

One of the major challenges impeding the implementation of the EMR system within developing countries is that of confidentiality and privacy. Patients and healthcare professionals in developing countries have expressed their concern regarding their information especially within HIV/AIDS and TB patients who still face stigmatisation in

the society (Tierney et.al, 2002). The World Health Organization (2006) affirms that users of EMR systems need an assurance that data gathered will be maintained in a secure environment. As with paper-based health records, local laws to cover electronic health records which address such concerns must be up-to-date and in place (World Health Organization, 2006).

2.6.7 Lack of adequate funding

Kleynhans (2011) asserts that one main factor to consider prior to the implementation of EMR is the financial burden which could range into billions of dollars. The costs accompanying the adoption of EMR are the most common and talked about barrier for EMRs adoption within developing nations (Morrissey, 2004). There is also a considerable amount of uncertainty with regards to the cost related to EMR system as costs associated with evolving technologies is always changing (Kleynhans, 2011). Moreover, the cost of computers and computer systems as well as shortages in the availability of funding for healthcare sector has been perceived as a challenge in the development of the EMR system (WHO, 2006). There is also a negative perception regarding the maintainability and sustainability of EMRs in developing nations in the event that donors funding the projects were to pull out.

2.7 Summary

The use of EMRs technology across the world has been on a steady increase, even though in less developed countries their adoption and implementation is still remains poor (Ohuabunwa et al., 2015). This chapter highlighted the perceived benefits of using the EMR system. It was revealed that EMRs have a number of benefits such as improved decision support, improved access to information, financial improvements, time improvements and patient monitoring improvements. Furthermore, it was also

discovered that the use of EMR systems has far reaching consequences which include things like security issues. The chapter also reviewed that resistance from healthcare professionals, lack of funding, brain drain, negatively affects the development of EMR systems in developing countries, particularly in Africa.

Table 2.1: Summary of Benefits and Challenges of EMRs technology in Developing countries

Country	**EMRS, Software being used**	**Benefits**	**Challenges**	**References**
India	National Rural Health Mission (NRHM)	• accuracy • efficiency • cost benefits	• Inter-operability standards issues • lack of funds • shortage of suitable governance health policies.	Stone, 2014; Vital Wave Consulting, 2009; World Health Organization, 2014; Sharma and Aggarwal, 2016.
Zambia	ZEPRS; SmartCare	• improved continuity of patient care; • improved the confidentiality of sensitive patient data; • less paperwork burden on healthcare workers; • improved the quality of patient data; • improved decision support.	• computer down time • threats to confidentiality • lack of connectivity • negative attitudes towards computers.	Moomba, 2017; Chi et al. 2011; Mweebo, 2014; Ministry of Health Zambia, 2013; Vital Wave Consulting, 2009.
Ghana	DHIMS (District Health Information Management System)	• improved the quality of healthcare • reduced the number of medical errors • contributed to a reduction in costs	• poor human resources • limited funding • lack of coordination in the nature of EMRs deployment	Da-Costa Vroom et al., 2017; Achampong, 2012; Abdulai, 2009.
Malawi	DHIS (District Health Information System); Open MRS;	• quick access to patient records; • ability to flag abnormal results; • elimination of hand written prescriptions;	• staff shortages and inappropriate re-deployment. • lack of adequate and appropriate training for healthcare workers	Tough and Lihoma, 2017; Msiska et al., 2017; Akanbi et al., 2011.

	DREAM Software.	• assist in making informed decisions	• high cost of set-up and maintenance	
Kenya	AMRS; PACS; OpenMRS; Funsoft; Bomu; Care 2000; Trimed; Ehospital	• Foster clinical decision support; • enabled order entry and medication prescribing; • ensured data security and confidentiality; • allowed the sharing of electronic information between healthcare.	• lack of infrastructure • shortage of skilled labour • absence of proper a policy and regulatory framework • limited funding	Waithera, et al., 2017; Wamae, 2015; Chebole, 2015; Juma et al., 2013; Douglas et al., 2010
Ethiopia	SmartCare	• improving the effectiveness of the Healthcare delivery; • increasing the speed and access to quality health information.	• poor existing infrastructure • frequent power outages • network failure	Mengesha, 2011
Uganda	Careware; OpenMRS; DHIS2; MVRS.	• improved continuity of patient care • efficiency • accuracy • cost benefits	• Shortage of technical personnel • high cost of equipment, software and lack of funds • difficulty in converting paper based documents into electronic format	Kiberu et al., 2017; Banshanga, and Ejiri, 2016
Zimbabwe	OpenMRS; DHIS2;	• cutting costs • an access to medication history of patients which improves safety • an improvement in the relationship between healthcare workers and patients • improving the quality given to patients	• lack of skilled healthcare workers, • poor infrastructure owing to low levels of investment in EMRs technology. • red tape environment. • the uncoordinated nature of EMRs deployment.	Matavire, 2016; Ministry of Health and Child Welfare, 2012; Sood et al. 2008.

From the above summary table, it is evident that most developing countries have implemented the use of EMRs technology within their healthcare facilities. The most common benefits derived from the use of EMRs in most developing countries include improving the effectiveness of the healthcare delivery to patients, and cutting costs. Though there are significant benefits derived from the use of EMRs technology, it is apparent that most developing countries encounter some challenges.

CHAPTER THREE

THEORETICAL FRAMEWORK

3.1 Introduction

The purpose of this chapter is to discuss the theoretical model of the research. Gregor, (2006) defines a theory as, *"…an abstraction of entities that describes, explains, and improves understanding of the worldview and provides predictions of the future and their interventions and actions*". Gregor (2006) further argues that phenomenon generalisation, causation and interactions are located at the centre of defining a

theory. A theory is a lens utilised as an advocacy tool to describe phenomena that is being studied and to provide the researcher with a guide on how to collect data and analyse it (Cresswell, 2009). This study made use of the Technology-Organization-Environment (TOE) framework and the Diffusion of Innovation (DOI) theory as a framework to investigate the organisational-level adoption of new technologies. These two theories were selected because they provide an explanation of how and why organisations accept particular technologies. These theories also determine the acceptance and adoption levels of innovative technology within organisations. The study puts forward a conceptual theoretical framework which is discussed and the propositions of the theoretical model are presented.

This chapter is arranged as follows: Section 3.2 discusses Rogers' Diffusion of Innovations (DOI) theory in general. Section 3.3 discusses in general the Technology-Organization-Environment (TOE) framework. Section 3.4 provides a combination of both the DOI theory and TOE framework, and further provides a justification of using both these theories. Section 3.5 discusses the proposed theoretical model and puts forward the propositions of the study. Section 3.5 provides a summary to conclude the chapter.

3.2 Rogers' Diffusion of Innovations (DOI) Theory

In 1962, Everett M. Rogers put forward the DOI theory, which is among the oldest and most used technology adoption theories in different fields of study (Alatawi, Dwivedi and Williams, 2013). Rogers (2003) defines the diffusion of innovation as the "*process in which an innovation is communicated in certain channels over time among the members of a social system*" and innovation as "*an idea, practice or project that is perceived as new by an individual or other unit of adoption"* (Rogers, 2003). He also argues that the perceived benefits and features of a given technology by organisations are more important than the real measures of these characteristics, therefore their influence has a strong impact on adopting decisions. The organisation can make informed decisions based on the available information the moment innovation is communicated to individuals within the organisation. The way the information is interpreted contributes to the collective adoption decision of the innovation (Rogers,

2003). The theory seeks to cast out any doubt about the innovation to encourage the adoption of the innovation. Technological innovation adoption is dependent on the potential adopter's perception of the innovation (Ahmadi, Nilashi, and Ibrahim, 2015; Oliveira and Martins, 2011). Therefore, the DOI theory sets the basis for further research theories in innovation adoption in information systems (Iqbal et al., 2013).

The DOI theory is comprised of three characteristics which are individual characteristics, internal characteristics of organisational structure and external characteristics of organisational. Individual characteristics describe the leadership's attitude towards the adoption of a particular technology. This characteristic is of significance since it describes the perception of leadership in an organisation determines how the rest of the organisation will perceive the innovation (Rogers, 2003). Whereas, according to Rogers (2003), the internal characteristics of organizational structure include centralization, complexity, formalization, interconnectedness, organizational slack and size. Rogers (2003) asserts that centralization refers to the level to which control and power in an organization are concentrated in the hands of a relatively few individuals. He goes further to mention that complexity refers to the degree to which members of an organization have a fairly high level of knowledge and expertise between them. Formalization is referred to as the level in members of an organization are emphasised to follow the rules and procedures (Rogers, 2003). Whereas, according to Rodgers (2003) interconnectedness refers to the level at which the units in a social system are linked by interpersonal networks. Organizational slack denotes the degree to which uncommitted resources are accessible to an organization while size refers to the total number of workers in the organization (Rogers, 2003).

Lastly, external characteristics refer to the system openness of an organisation towards the adoption of a particular technology. System openness is concerned with the systems' extensions and improvements, and the ability of the new components to be integrated with already existing components (Oliveira and Martins, 2011). In this study, the researcher considered the organisational size and complexity as indicators in the context of EMRs adoption within Zimbabwean public healthcare facilities. This is because organisational size and complexity are key in the adoption of EMRs technology within healthcare facilities. For effective EMR adoption, there is need for adequate skilled labour that will be able to operate the technology. The organisation

also has to have a complexity factor, which means that healthcare workers need to have enough knowledge and expertise to operate EMR technology.

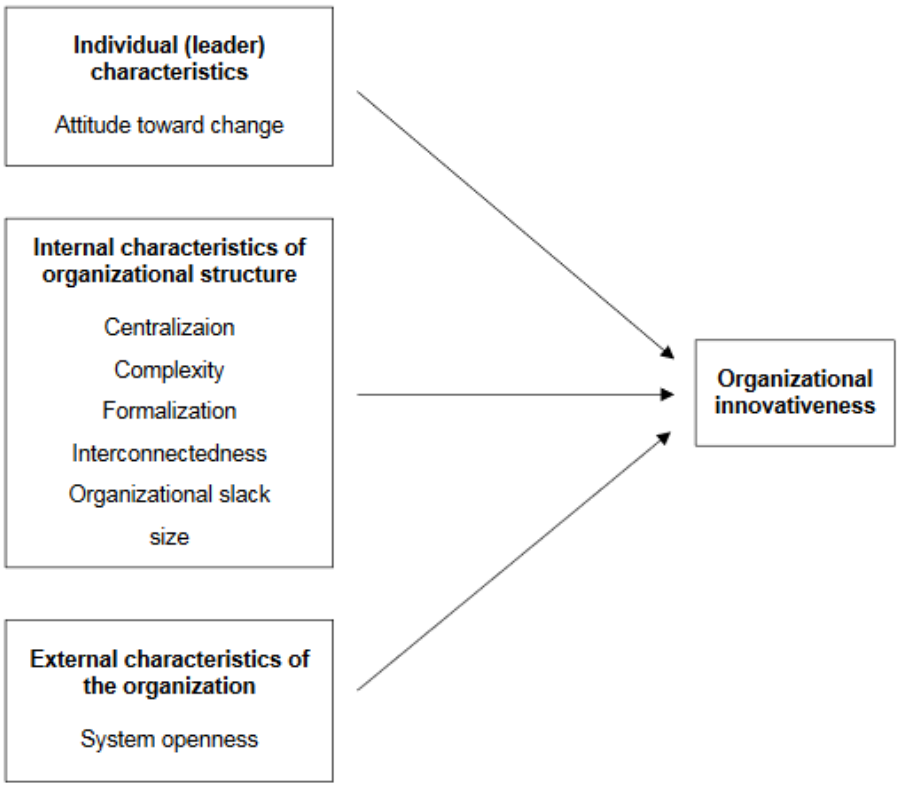

***Figure 3.1**: Diffusion of innovations (Rogers, 2003)*

3.3 Technology-Organization-Environment (TOE) framework

This framework was developed by Tornatzky and Fleischer in 1990 to study the adoption of technological innovations by organizations (Tornatzky and Fleischer, 1990). The framework identifies three distinct aspects of an organisation's context that influence the adoption and implementation processes which are technological, organizational and environmental contexts which influence the adoption of an innovation at organisational level (Oliveira and Martins, 2011). The technological context of the TOE framework refers to both external and internal technologies of an organisation (Oliveira and Martins, 2011). It also includes the internal present state of technology and equipment in the firm (Ahmadi et al., 2015; Arpaci, 2012). According to Oliveira et al. (2014), the technological context emphasizes on how technological

characteristics may impact the adoption of innovative technologies. The common technological characteristics which are grouped under Available characteristics (see Figure 5) are trialability, perceived barriers, perceived ease of use, relative advantages, perceived importance of compliance, perceived risks, complexity and compatibility (Malak, 2016).

With regards to the organizational context, it intends to describe the descriptive characteristics of an institution (Oliveira and Martins, 2011).These attributes include the level of centralization, firm size, formalization, complexity of the managerial structure, the human resources quality. According to Baker, Dwivedi, Wade and Schneberger (2012) the organizational context is crucial in the adoption of technology at an organisation and it influences greatly the organisation's social interaction between workers. The environmental context describes the firm's operational environment (Oliveira and Martins, 2011).This is the arena in which the firm operates in which include aspects such as industry, competition, laws and regulations, and dealings with government. These external factors will either present challenges or opportunities for the adoption of technological innovations (Arpaci, 2012; Oliveira and Martins, 2011).

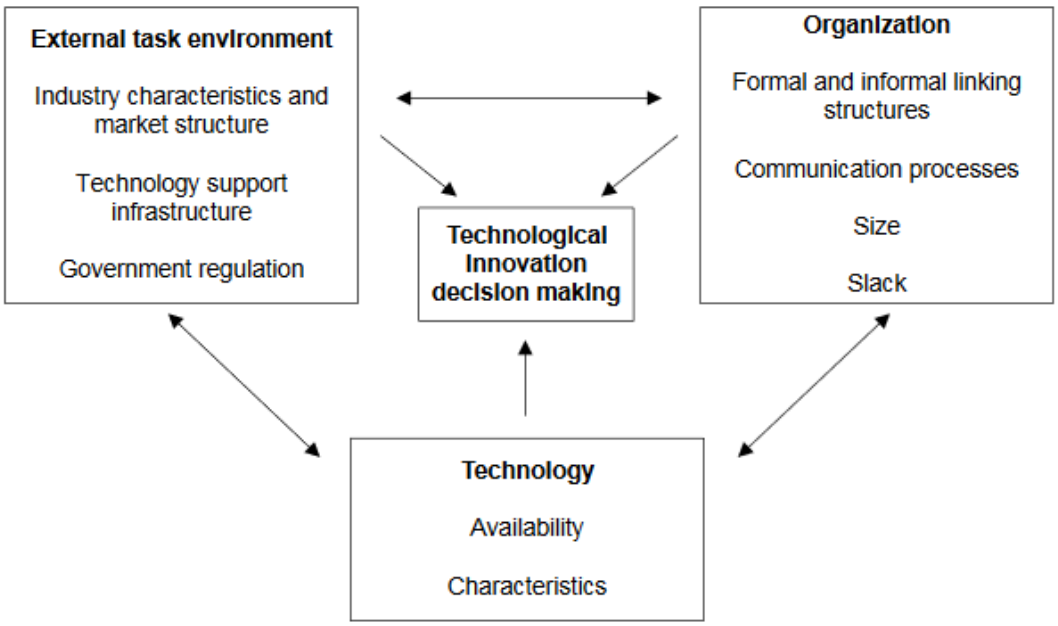

Figure 3.2: *Technology, organization, and environment framework (Tornatzky and Fleischer, 1990)*

The TOE framework was initially introduced, and later utilized in technology adoption studies, which provided a helpful expository framework that can be utilized for studying various technological adoption innovations (Oliveira and Martins, 2011). The TOE framework has a strong theoretical premise, solid empirical support and the capability of utilization to technology adoption spaces, however particular factors distinguished within the contexts differ crosswise over various studies (Oliveira and Martins, 2011). To conclude, this study focused on both the internal and external contexts of the TOE framework such as relative advantage, compatibility, top management support, complexity, organisational size perceived barriers, organisational readiness and perceived risks/disadvantages.

3.4 DOI Theory and TOE Framework Combined

This study combined the DOI and TOE theories so as to achieve a more holistic approach to EMR adoption within Zimbabwean hospitals. The DOI theory is limited as it argues that the diffusion of innovation relies on the basis of two factors which are: the characteristics of the technology and users' perceptions of the system. Thus to complement this limitation, the TOE framework was included. The TOE framework as discussed above puts forward the notion that, the adoption of EMR technology is influenced by technological, organisational and environmental contexts. Combining these two theories thus provides a more complete and integrated explanation of intra-healthcare institution innovation adoption.

There are several studies that have combined the TOE framework and DOI theories. These include the following: Thong in 1999 combined CEO attributes from DOI with the TOE framework (Thong, 1999). Chong et al. in 2009 (Chong, Lin, Ooi, and Raman, 2009) added innovation attributes (relative advantage, compatibility, and complexity) from the DOI as another additional factor in the adoption study titled information sharing culture characteristics to the TOE framework. Zhu et al in 2006 integrated compatibility, relative advantage, cost, and security factors from DOI with TOE framework (Zhu, Dong, Xu, and Kraemer, 2006). Wang et al. in 2010 combined relative advantage, complexity, and compatibility from DOI with the TOE framework (Wang, Wang, and Yang, 2010). The two are believed to complement each other's strengths and shortcomings. DOI's most notable shortcomings includes that it fails to take into consideration environmental factors such as government laws and

competition. These represent the arena in which the firm operates, and could influence the technology adoption and implementation process. The combination of the two aid in predicting the adoption decisions based on factors that are related to the technology itself (such as the characteristics of the technology, or users' perception about the technology). Thus combining the TOE framework and the DOI theory will help in understanding the adoption of Electronic Medical Records systems by the primary health sector in Zimbabwe.

3.5 Proposed Theoretical Model

There are a number of theories that can be utilised to understand and determine the adoption and use of different technological innovations by an organisation. The existent theories consider different characteristics of technological diffusion within organisations. However, as observed above, these theories are limited in their approach to understanding and determining the adoption of new technology by public healthcare institutions, hence this study proposes a new theoretical model (See Figure 5). The three dimensions drawn from both the DOI theory and the TOE framework models represent the different characteristics of technological adoption and use. These dimensions that make up the proposed theoretical model are as follows: organizational characteristics, environmental factors and technological factors. In terms of organisational characteristics, the researcher included size, organizational readiness and top management support. For environmental factors the researcher included industry characteristics, technology support infrastructure and government regulation. Relative advantage, compatibility, perceived barriers, perceived risks and compatibility were encompassed in terms of technological factors. This theoretical model proposed by the researcher acted as a lens which guided the research process (Creswell, 2009).

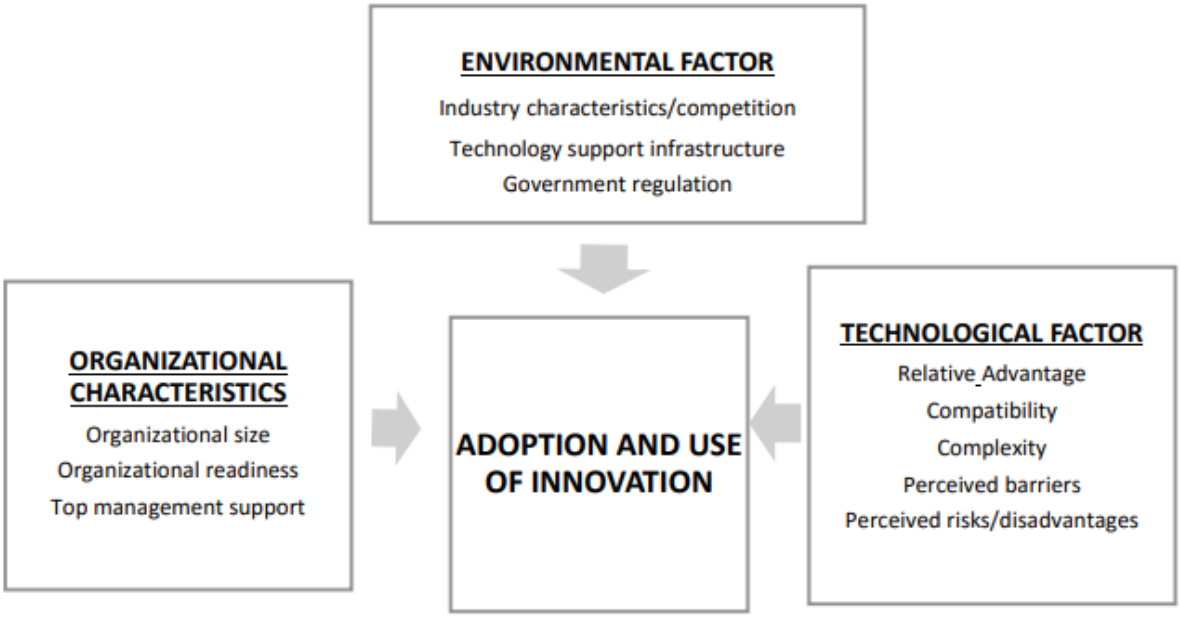

Figure 3.3: *Proposed EMRs adoption model*

3.5.1 Technological Factor

Technological factor describes the characteristics of EMRs technology and detects factors that have the potential to influence public healthcare facilities' decision to adopt these technologies. This study considered three factors namely relative advantage, compatibility and perceived barriers (risks and complexity). Relative advantage, drawn from the DOI theory denotes how much an organisation will draw benefits from adopting a particular form of technology (Alkhater, Wills and Walters, 2014). Malak (2016) cites that relative advantage is generally expressed in terms of its importance in society, the economic significance, and how it can make improvements in existent technologies. Within the context of this study, relative advantage means improved quality of healthcare, reduced number of medical errors, and contribution to the reduction in costs. Consequently, the researcher proposes that the greater the perceived benefits by the healthcare facilities, the greater the potential for adopting EMRs technology. Another factor considered by the researcher is compatibility, which refers to whether the most recent innovation is consistent with current industry practice and values or not (Rogers, 2003). According to Malak (2016), compatibility is an assessment of the how effective particular technologies match the jobs they are intended to perform, the organisational culture and experiences, as well as the needs

of future users. The less compatible EMRs systems are, the higher the uncertainty from healthcare facilities in adopting them. Therefore, the researcher proposes that the more compatible a technological innovation is, the more likely the adoption process will occur. The researcher also considered one of the elements of the DOI theory called complexity. Prior to a technology being applied to a particular organisation, the difficulty or complexity of a technology is considered before adopting it, which usually influences the decision to adopt. The more complex EMR technology is, the less likely that public hospitals will be influenced to adopt it, therefore, perceived barriers are the challenges that an organisation may encounter after the adoption of a particular technology. When a technology is perceived as having too many barriers, this may influence the organisation's adoption. This study proposes that the less perceived barriers, the more likely healthcare organisations will be influenced into adopting EMRs. The study also considered the perceived risks that describe the negative impacts that organisations may consider. Hence, this study proposes that the more risks perceived regarding EMRs technology, the less healthcare facilities will be influenced into adopting it.

3.5.2 Organisational characteristics

Organisational characteristics are aspects critical in influencing organisations to make decisions on the adoption and use of EMRs technology. In this study the organisation refers to government public healthcare institutions. The researcher considered the following organisational characteristics: organisational size, organisational readiness and top management support. The most important being the organisational size. According to Alkhater, Wills and Walters (2014) the size of the organisation is determined by the scope of its workforce, the number of investments made, the target market and the revenue generated yearly. Therefore, larger healthcare facilities have more resources which may influence their decision to adopt EMRs technologies. Therefore, this study proposes that, the larger the healthcare facility the greater the potential to adopt and use EMR systems.

Organizational readiness is one of the crucial factors influencing adoption on EMRs technology by healthcare facilities. Malak (2016) denotes that organizational readiness is the capacity for organizations to manage and invest in adopting innovative technologies by having the suitable expertise, resources and technical IT

management. A study by Oliveira, Thomas and Espadanal (2014) found that the organizations' level of technological adoption readiness influences the adoption of new technologies. Therefore, the study assumed that high organisational readiness influences the decision to adopt EMRs technology by healthcare facilities. Top management support is key in the adoption of EMRs technologies within Zimbabwean public healthcare facilities. The influence of top management is crucial as they have the capacity to effect acceptance and push for change towards the adoption of EMRs technology. In a study by Lee, Shiue, and Chen (2016), the findings show that a fully committed and supportive top management plays an important role in the successful adoption of technological innovations. Thus, the researcher reasonably assumes that top management support has th ability to influence the adoption of EMRs technology public hospitals in Zimbabwe's.

3.5.3 Environmental factor

The environmental factor represents elements that may affect healthcare facilities' intent to adopt EMRs technology. The study identified three elements namely industry characteristics/competition, technology support infrastructure and government regulation. Industry competition has the ability to influence an organisation to adopt EMRs technology and derive more benefits and better operational efficiency (Alkhater et al., 2014). A study by Ghobakhloo, Arias-Aranda and Benitez-Amado (2011) revealed that pressure from competition influences significantly the adoption of information technologies by organisations. Organisations are pressured into adopting EMRs technology so as to match other organisations in the industry that are already realising the benefits of using this technology. Therefore, the researcher proposes that high competitive pressure influences healthcare facilities to adopt EMRs technology. Government regulation is one of the key environmental factors that determines the success of adopting EMRs technology in Zimbabwean hospitals. Alkhater et al. (2014) believes that government regulation has the ability to influence organisations to become reluctant in adopting a particular technology due to a lack of regulation that can support organisations in instances where data is breached.

Therefore, if organisations do not comply with the government's laws, this could have possible legal consequences (Delmas, 2002). Therefore, it was assumed that

favourable regulatory environment may influence the adoption of EMRs technology within Zimbabwean hospitals.

3.6 Summary

This chapter discussed the two theories that were used, which are the DOI theory and the TOE framework. These theories were considered due to their focus on organisational adoption of new innovation. A combination the two theories helped predict the adoption decisions on the basis of factors related to the technology itself. The theories also helped to explore the perceived lack of adoption of EMRs and the factors influencing this lagging behind by developing countries. The DOI and TOE theories both had their limitations, thus combining them provided a more holistic approach to explaining the adoption of EMRs technology. This chapter proposed a theoretical framework which was used as an advocacy lens and as a tool for describing and explaining the research. The theoretical framework proposed by the study was made up of three dimensions drawn from both the DOI and the TOE models. The three dimensions which are organisational characteristics, environmental factors and technological factors, represent the different characteristics of technological adoption and use.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Introduction

This chapter's main focus hinges on the methodological requirements of the research study.

4.2 Research Philosophy

The researcher considered two research philosophies, namely the interpretivist and the positivist philosophies. Interpretivist studies enables researchers to gain an in-depth understanding of an individual's (decision-makers) thought process, through a paradigm that our knowledge of reality is gained only through social constructions such a language, consciousness, shared meanings, documents, tools, and other artefacts (Myers and Klein, 1999). Therefore, reality is socially constructed by the active participants; in this case this refers to the healthcare workers, who shape their own understanding of EMRs technology based on their social context. Whereas according to Babbie (2013), the positivist philosophy is grounded on the scientific approach. Positivism proposes that natural science principles can be applied in social research (Denscombe, 2010). Therefore, the positivist philosophy unlike the interpretivist is more objective when dealing with human beings (Motuba, 2014). Positivism relies on theories that can be practically tested (Babbie, 2013). Reality is objective and can be measured making use of methodologies which are quantifiable, objective, and independent of the study (Antwi & Hamza, 2015). This study made use of the interpretivist research philosophy. The researcher sought to understand the factors influencing EMRs adoption at primary healthcare institutions in developing countries. Decision-makers and key individuals involved in healthcare provision as well as IT management, play a significant role in the decision-making process to adopt EMRs.

4.3 Research Approach

A deductive approach was used with already existing theories to understand how EMRs were adopted in other countries, using a combination of Roger's Diffusion of Innovations (Rogers, 2003) theory and the Technology-Organisation-Environmental framework (Tornatzky and Fleischer, 1990). Additionally, there is significant literature on factors influencing EMRs adoption in organisations (Ajami and Al-Qirim, 2013; Amalina et al., 2012; Beasley et al., 2005; Fadun, 2009; Kanhai and Ganesh, 2014; Lundquist, 2011; Paape and Speklè, 2012; Zhao et al., 2013).

4.4 Research strategy

This section discusses the research strategy of the study. This study chose to make use of a case study, in order to obtain a comprehensive understanding of lack of adoption of EMR systems in developing countries. Case studies aim to focus their attention on a single instance of some social phenomenon, such as a village, a family, or a juvenile gang (Babbie, 2013). This research strategy has the benefit of being able to draw experiences and perceptions of individuals from their own perspective, and challenge the narrative or structural assumptions. There are two types of case studies, namely a single-case study and a multiple-case study. Yin (2003) distinguished between a single-case study, which consists of a single case, and a multiple-case study which makes use of two or more cases. Since, case study research focuses on a single-case; it is often selected for its unique characteristics, whereas the multiple-case studies allow the researcher to explore the phenomena under study through the use of a replication strategy (Gustafsson, 2017). Furthermore, multiple cases can allow theory to be better grounded in more varied evidence, with the particular advantage that they allow for cross-case comparison (Zach, 2006). Nonetheless, a single-case study approach was utilised in this study.

4.5 Research Purpose

This research study was exploratory in order to discover new and valuable insights (Saunders et al., 2009) into the adoption of EMRs phenomenon by primary healthcare institutions in Zimbabwe. EMRs adoption is relatively a new research area in developing countries particularly in Zimbabwe, hence the need for further enquiry in this field. Exploratory studies are generally carried out by reviewing literature, face-to-face interviews or focus groups discussions (Saunders et al., 2009). An extensive review of literature and documentation was done in addition to face-to-face interviews with key personnel within the Ministry of Health and Child Care (MoHCC) involved in medical records keeping and use. Likewise, Ben-Assuli (2015) used explanatory and exploratory approach in examining EMRs as a facilitator of better healthcare quality.

4.6 Study Site

This study explored the phenomenon of Electronic Medical Records systems in Zimbabwean primary healthcare institutions. The goal of the study was to investigate the lack of adoption of Electronic Medical Records systems by primary healthcare institutions in developing countries using an interpretative case study approach focusing on the Zimbabwean context. This study collected data from two major hospitals in Zimbabwe's capital city Harare. The first study site had a total number of 2 537 individuals employed at the institution in 2017. The hospital has a total number of 5 000 beds and is situated in Harare on a 400 000 square meter piece of land (Samusodza, 2016). The hospital is composed of a general medical and surgical section, the hospital includes a maternity section; a section which specialises in eye treatment; and an annex for psychiatric patients and several specialist paediatric. The hospital also has twelve theatres in the main hospital complex. The second study site employs more than 2 000 workers with a total capacity of 1 200 beds. The hospital is located in the Southerton District of Greater Harare. This hospital is the largest referral centre in Zimbabwe, and also takes cases from the SADC region (Samusodza, 2016). Furthermore, the hospital provides healthcare services for the 1 500 000 residents in Greater Harare, plus a number of the adjoining rural areas.

4.7 Research Sample

The medical facilities selected for this study fall under the Ministry of Health and Child Care in Zimbabwe. A non-probability sampling method called purposive sampling was used to identify specific groups of people judged to represent, or who live in circumstances relevant to the phenomenon of the study. Participants were identified on the basis of their knowledge and experience with EMR systems. The researcher targeted participants with access to important sources of information (Saunderset al., 2009). The targeted population for this research were key staff members privy to patients' medical records management within the primary healthcare facilities.

14 participants were interviewed for the study as shown in Table 1. Interpretivist research studies usually prefer smaller samples as data collected during interviews is more in-depth (Saunders et al., 2009). For example, Bhattacharjya and Chang (2006) used a sample of two senior ICT managers and two senior business development

managers during their qualitative study which also used semi-structured interview questions as an instrument.

Sample	Number per Facility	Number of Facilities	Total number of Participants
Doctors	2	2	4
Nursing officer in-charge	2	2	4
Medical Director	1	2	3
ICT Manager	1	2	3
TOTAL	**6**	**8**	**14**

***Table 4.1**: Sample Details*

4.8 Instrument design

The study will make use of in-depth interviews in obtaining data for the study. The research instrument was subdivided into sections such as interviewee demographic section; organisational question section: environmental question section and the closing question section (see Appendix C). The interviewee demographic section was used to capture background information about the respondents' awareness of EMRs section, the perception of institutional EMRs adoption section, and the organisational and environmental section. To ensure reliability, validity and clarity of the instrument, a pilot study was conducted. This process involves pretesting the research instrument on a small scale. This was done to enable the researcher to identify problems and refine data collection strategy (Yin, 2009). The research instrument was piloted with two respondents and two information systems academics within the Faculty of Commerce at the University of Cape Town.This was to ensure that the data-collection process produced relevant data, in order to achieve the aim and objectives of this study. The research instrument was made up of open-ended questions to enable the researcher to observe, record and ask.

4.9 Data Collection Process

Posterior the literature review, the researcher started the data collection process after getting the ethics approval from the Ministry of Health and Child Care in Zimbabwe

and from the University of Cape Town respectively. Face-to-Face interviews and document analysis were being done qualitatively (Harris and Brown, 2010). The interview sessions provided the researcher with rich qualitative data, during in-depth interviews the researcher tape-recorded and penned down notes after obtaining permission from the research informants. Each interview session was an average of 30 minutes. A letter of introduction that introduces the details of the study, as well as the purpose and objectives for the research was given to the respondents before the interview session began (see Appendix B). Additionally, participants were advised of their right to participate in the study at their own volition and they were informed that they could opt out at any given time with no obligations. This was accompanied by a participant consent form which participants signed when they agreed to participate in the study.

The researcher obtained the ethics approval and signed off prior to the distribution of these documents to the intended respondents.

During the interviews the researcher took down notes,capturing body language and other actions from the respondents which the voice recorder would not be able to capture. To ensure consistency and eliminate unforeseen challenges, Turner (2010) suggested a systematic procedure on preparing and conducting semi-structured interviews which Creswell (2014) also concurred that should be adopted. McNamara (2009) identified the 8 principals to carrying out semi-structured interviews. These are: "(*1) choose a setting with little distraction; (2) explain the purpose of the interview; (3) address terms of confidentiality; (4) explain the format of the interview; (5) indicate how long the interview usually takes; (6) tell them how to get in touch with you later if they want to; (7) ask them if they have any questions before you both get started with the interview; and (8) don't count on your memory to recall their answers"* (Turner, 2010). The researcher was guided by these 8 principles during the interview process.

4.10 Data Analysis

The study employed thematic analysis to analyse the data obtained from the interviews. Braun and Clarke (2006) describe the thematic approach as a process that involves subjecting the collected qualitative data through a rigorous reviewing process with the purpose of identifying, analysing and reporting the themes that emerge.

	PHASES	DESCRIPTION OF ANALYSIS PROCESS
1	Familiarising myself with data	i) Narrative preparation, i.e. transcribing data ii) (Re-)reading the data and noting down initial ideas
2	Generating initial codes	i) Coding interesting features of the data in a systematic fashion across entire data set ii) Collating data relevant to each code
3	Searching for themes	i) Collating codes into potential themes ii) Gathering all data relevant to each potential theme
4	Reviewing themes	i) Checking if themes work in relation to the coded extracts ii) Checking if themes work in relation to the entire data set iii) Reviewing data to search for additional themes iv) Generating a thematic "map" of the analysis
5	Defining and naming themes	i) On-going analysis to refine the specifics of each theme and the overall story the analysis tells ii) Generating clear definitions and names for each theme
6	Producing the report	i) Selection of vivid, compelling extract examples ii) Final analysis of selected extracts iii) Relating the analysis back to the research question, objectives and previous literature reviewed

Table 4.2: *Phases of the thematic analysis (adopted from Braun & Clarke, 2006)*

4.10.1 Familiarising oneself with the data

Since much of the data from the field was tape recorded, the initial step of the researcher was to familiarise himself with the data through a narrative preparation process, which involved transcribing the recordings into text. The researcher went through the data noting down developing themes within the data. The interview recordings were transcribed using an online facility called Otranscribe.com. This platform allows for listening, pausing and slowing down the recording, while transcribing into a verbatim transcript. When the transcription process was completed, the data was ready for analysis. The researcher organised the transcribed qualitative data into tables (see Table 4.3). The first column contains the code names of the respondents, which were assigned to them by the researcher and the second column is contains the actual responses given by the respondents during the data collection.

Respondent	What do you think are the benefits of using EMRs as part of healthcare delivery? (Response)
Healthcare Professional 9 (HP, medical doctor)	This technology (EMRs) has allowed us to gain access to documents, results and historical patient information that would have taken ages to obtain if they were paper-based. EMRs allows information to be access easily.
Healthcare Professional 10 (HP, medical director)	The information that is provided by EMRs technology is not difficult to read and can be put in storage for a long time as compared to paper files which may be too old or torn while they are being stored.
Healthcare Professional 2 (HP, nurse)	EMRs systems have improved and changed the way in which the hospital stores patient documents as they do not require hard copy material which saves money. Also accessing patient information electronically has saved a lot of time if we want to a patient's record.
Healthcare Professional 6 (HP, medical doctor)	EMRs have been of great benefit for us (healthcare workers) as they make it easier to access patient history. Sometimes we get so busy that accessing patient information fast makes our job much easier and also allows us to deliver better patient care.

Table 4.3: *Familiarising oneself with the data*

4.10.2 Generating initial codes

The researcher then initiated the coding of the data using an inductive approach. This process allowed key highlights within the transcribed data to be coded without any interpretation. This stage gave the researcher a chance to reduce the qualitative data into units that are smaller, which also drew the researcher's interest and attention. This stage of generating codes guided the researcher into creating a code book which is illustrated in Table 4.4. For instance, one healthcare professional (HP2, nurse) stated how much EMRs technology has benefited both the healthcare workers and the hospital by mentioning that, "*EMRs systems have improved and changed the way in which the hospital stores patient documents as they do not require hard copy material which saves money*." The respondent implied that EMRs technology saved financial resources. This became one of the themes that the researcher labelled as "*Financial Improvement*s".

Initial theme	Data extracts
Financial Improvements	EMRs systems have improved and changed the way in which the hospital stores patient documents as they do not require hard copy material which saves money….. (HP2, nurse) The use of EMRs systems has provided this hospital with a positive benefit us to broadcast documents electronically which obviously saves a lot of money needed to transport the documents from one point to the other. (HP 11, nurse)
Lack of adequate funding	I think Zimbabwe hasn't fully adopted the EMR system because it's very expensive to apply to hospitals. The computers and other components required need a lot of money to obtain and install. (HP 5, ICT manager) The equipment required to implement EMRs technology is really expensive, that is one of the biggest challenges that Zimbabwean Hospitals encounter when trying to adopt this technology. I believe if the government plays a part in providing the adequate financial resources this technology will be a success. (HP 6, medical doctor)
Providing incentives	I believe the public hospitals need support and incentives for them to fully adopt EMR systems, because without that I don't see any way they would simply adopt this technology on their own. (HP 10, medical director) The government can simply use financial incentive to encourage public healthcare facilities to use EMRs technologies in their operations. (HP 5, ICT manager)

Table 4.4: *Generating initial codes*

Table 4.5: *Searching for themes*

Theme	Description	Initial theme	Data extracts
Benefits of EMRs technology	EMR systems provide a variety of benefits to healthcare institutions that implement them.	Financial Improvements	EMRs systems have improved and changed the way in which the hospital stores patient documents as they do not require hard copy material which saves money….. (HP2, nurse) The use of EMRs systems has provided this hospital with a positive benefit us to broadcast documents electronically which obviously saves a lot of money needed to transport the documents from one point to the other. (HP 11, nurse)
		Access to Information	This technology (EMRs) has allowed us to gain access to documents, results and historical patient information that would have taken ages to obtain if they were paper based. EMRs allows information to be access easily. (HP9, medical doctor) The information that is provided by EMRs technology is not difficult to read and can be put in storage for a long time as compared to paper files which may be too old or torn while they are being stored. (HP 10, medical director)
Challenges hampering the adoption of EMRs	There are a number of challenges that hamper the implementation of EMRs in Zimbabwean hospitals.	Lack of adequate funding	I think Zimbabwe hasn't fully adopted the EMR system because it's very expensive to apply to hospitals. The computers and other components required need a lot of money to obtain and install. (HP 5, ICT manager) The equipment required to implement EMRs technology is really expensive, that is one of the biggest challenges that Zimbabwean Hospitals encounter when trying to adopt this technology. I believe if the government plays a part in providing the adequate financial resources this technology will be a success. (HP 6, medical doctor)
		Lack of proper ICT structures	It will be difficult to fully implement EMRs technology because our country doesn't have proper structures to support such a system, more especially in places like the rural areas where network access is low or not there at all. (HP 3, ICT manager)
Solutions to EMRs adoption challenges	There are a number of solutions that the Zimbabwean government can use to encourage the implementation of EMRs technology within Zimbabwean hospital.	Providing incentives	I believe the public hospitals need support and incentives for them to fully adopt EMR systems, because without that I don't see any way they would simply adopt this technology on their own. (HP 10, medical director) The government can simply use financial incentive to encourage public healthcare facilities to use EMRs technologies in their operations. (HP 5, ICT manager)
		Legal concerns	I think the government needs to address the legal issues that protect patient information that is the only way EMRs systems can be implemented without any problems and its users will also be assured that patient data is protected by the law. (HP 14, medical director)

4.10.3 Searching for themes

At this stage, the researcher examined the data repeatedly, so as to identify themes in an effort to develop them. The researcher proceeded to code the themes and assigned them into groups. These groups as shown in Table 4.5. above, consist of column one which contains the main theme, column two provides a description of the main theme; column three is comprised of the sub-themes that form the main theme and column four consist of examples of the sub-themes.

4.10.4 Reviewing the themes

At this stage, the researcher aimed at assessing and refining themes obtained from the transcribed data. A deductive approach was taken to assign meanings to the themes by associating them to the EMRs theoretical literature. Through this process, the researcher aimed to give meaning to the qualitative data collected in the field. The reviewed themes created a meaningful picture, at the same time they showed clear and recognisable dissimilarities among them. This was done by ensuring that coded extracts within every theme were coherent and were collapsed to create a core theme. In table 4.6 below for instance, sub-themes such as “Financial Improvements” and “Access to Information” are grouped under a core theme named “Benefits of EMRs technology”

Table 4.6: *Reviewing themes*

Reviewed Themes	Theme	Description	Sub-theme	Data extracts
Perceptions of healthcare professionals on EMRs	Benefits of EMRs technology	EMR systems provide a variety of benefits to healthcare institutions that implement them.	Financial Improvements	EMRs systems have improved and changed the way in which the hospital stores patient documents as they do not require hard copy material which saves money….. (HP2, nurse) The use of EMRs systems has provided this hospital with a positive benefit us to broadcast documents electronically which obviously saves a lot of money needed to transport the documents from one point to the other. (HP 11, nurse)
			Access to Information	This technology (EMRs) has allowed us to gain access to documents, results and historical patient information that would have taken ages to obtain if they were paper based. EMRs allows information to be access easily. (HP9, medical doctor) The information that is provided by EMRs technology is not difficult to read and can be put in storage for a long time as compared to paper files which may be too old or torn while they are being stored. (HP 10, medical director)
Challenges hampering the adoption of EMRs	Challenges hampering the adoption of EMRs	There are a number of challenges that hamper the implementation of EMRs in Zimbabwean hospitals.	Lack of adequate funding	I think Zimbabwe hasn't fully adopted the EMR system because it's very expensive to apply to hospitals. The computers and other components required need a lot of money to obtain and install. (HP 5, ICT manager) The equipment required to implement EMRs technology is really expensive, that is one of the biggest challenges that Zimbabwean Hospitals encounter when trying to adopt this technology. I believe if the government plays a part in providing the adequate financial resources this technology will be a success. (HP 6, medical doctor)
			Lack of proper ICT structures	It will be difficult to fully implement EMRs technology because our country doesn't have proper structures to support such a system, more especially in places like the rural areas where network access is low or not there at all. (HP 3, ICT manager)
Solutions needed to address challenges in EMRs adoption	Solutions to EMRs adoption challenges	There are a number of solutions that the Zimbabwean government can use to encourage the implementation of EMRs technology within Zimbabwean hospital.	Providing incentives	I believe the public hospitals need support and incentives for them to fully adopt EMR systems, because without that I don't see any way they would simply adopt this technology on their own. (HP 10, medical director) The government can simply use financial incentive to encourage public healthcare facilities to use EMRs technologies in their operations. (HP 5, ICT manager)
			Legal concerns	I think the government needs to address the legal issues that protect patient information that is the only way EMRs systems can be implemented without any problems and its users will also be assured that patient data is protected by the law. (HP 14, medical director)

Themes		Data extracts
Benefits of EMRs technology	Financial Improvements	The use of EMRs systems has provided this hospital with a positive benefit us to broadcast documents electronically which obviously saves a lot of money needed to transport the documents from one point to the other. (HP 11, nurse)
	Decision support	Such a support system is very useful as it helps medical doctors to make decisions that wouldn't put the patient at risk, for example, some patients may forget prescriptions that they are allergic to, but with the EMR system, doctors can be informed of such details.(HP 12, nurse)
	Time Improvements	Sometimes at the hospital it will be so busy that retrieving archived medical documents from the repository will be strenuous, but the use of EMRs makes it easier and faster to obtain patient documents. (HP 14, medical director
	Access to Information	The information that is provided by EMRs technology is not difficult to read and can be put in storage for a long time as compared to paper files which may be too old or torn while they are being stored. (HP 10, medical director)
Challenges hampering the adoption of EMRs	Lack of adequate funding	The equipment required to implement EMRs technology is really expensive, that is one of the biggest challenges that Zimbabwean Hospitals encounter when trying to adopt this technology. I believe if the government plays a part in providing the adequate financial resources this technology will be a success. (HP 6, medical doctor)
	Resistance in the use of EMRs Shortages in Skilled labour	I think health workers (nurses, medical doctors, hospital administrators) resist it (EMR systems) because they feel like computers are more complicated and demand more work unlike the paper based system where you just write and you archive the documents. (HP 12, nurse) Here in Zimbabwe we are already facing shortages in the number nurses and medical doctors since most of them have migrated to other countries. The implementation of EMR technology maybe hampered by this challenge. (HP 7, medical director)
	Concerns of confidentiality and privacy	Not only are there proper infrastructures in place to implement EMRs, there aren't any laws in place to help protect people's personal information. I believe prior to the implementation of EMR systems, the issues of confidentiality and privacy need to be addressed. (HP 1, ICT manager)
	Lack of proper ICT structures	It will be difficult to fully implement EMRs technology because our country doesn't have proper structures to support such a system, more especially in places like the rural areas where network access is low or not there at all. (HP 3, ICT manager)
Solutions to EMRs adoption challenges	Providing incentives	I believe the public hospitals need support and incentives for them to fully adopt EMR systems, because without that I don't see any way they would simply adopt this technology on their own. (HP 10, medical director)
	Legal concerns	I think the government needs to address the legal issues that protect patient information that is the only way EMRs systems can be implemented without any problems and its users will also be assured that patient data is protected by the law. (HP 14, medical director)

4.10.5 Defining and Naming Themes and Producing Report

This step was of great importance to the researcher, as it offered him an opportunity to define and name each theme. Themes were grouped under the following themes: perceptions of healthcare professionals on EMRs, current state of EMRs adoption by the healthcare institutions, challenges hampering the adoption of EMRs and solutions to the adoption challenges of EMRs. The last step involved producing the final report where the researcher selected clear examples and related them back to the research questions, objectives and previously reviewed literature. The above table (Table 4.7) provides a summary of findings discussed in the findings chapter.

4.11 Ethical considerations

The researcher sought ethics approval from the University of Cape Town's ethics committee prior to data collection. The researcher also obtained permission from Zimbabwe's Ministry of Health and Child Care to carry out the study within the targeted healthcare facilities. The researcher ensured that the participants from the respective primary healthcare facilities were notified of their right to participate in the research on their own volition and they were made aware that they can withdraw at any stage. Pseudonyms were used so as to maintain anonymity and confidentiality of participants. Anonymity was also endorsed for both the participating healthcare facilities due to the fact that, the researcher had access to confidential information. Personal, medical or biographical data was not collected in this research. The only possible identifiable data was only the participant's position at the facility. This was used only by the researcher for data analysis purposes. A consent form was availed to participants and a signed copy was put on file. The participants were also promised a final copy of the research. None of the research participants were offered financial or non-financial reward for participating in the study. There were no additional human resources required to assist with the research on behalf of the researcher.

4.12 Limitations and assumptions

The researcher would have a larger sample size, however due to time constraints for completing the dissertation, the researcher only interviewed a sample chosen by use

of systematic non-probabilistic sampling. The researcher holds assumptions that all primary healthcare institutions have a medical records system (be it paper-based or electronic) in place due to the legislative requirements by the World Health Organisation and the Ministry of Health and Child Care. The two main primary healthcare institutions in Zimbabwe will be a representative of the remaining primary healthcare facilities due to the fact that they are all under the Ministry of Health and Child Care in Zimbabwe. In addition, factors such as lack of research funding from the University towards this study acts as a limitation inhibiting the inclusion of all 10 provincial hospitals in Zimbabwe. The researcher used his own resources for this study and the inclusion of all the 10 provincial hospital was financially infeasible. Due to the limited time constraints to complete this study, only two primary healthcare institutions were selected in the capital city Harare.

4.13 Summary

This chapter aimed to provide an indication of the methodological design employed by the study. The chapter gave an in-depth justification of why the researcher employed elements such as the research design, the data collection instruments, the sampling techniques and the analysis methods. A qualitative research was chosen in order to gain an in-depth understanding of the issues that hampered the implementation of EMRs in Zimbabwean hospitals. Qualitative research is a broad approach that seeks to study social phenomena and gain a deeper understanding of the activities and perceptions of people. The study made use of in-depth interviews as means of data collection methods. The study further used a thematic analysis to analyse the outcomes of the study in order to gain a deeper understanding of the themes that emerged from the research. This chapter was the basis of the data gathering and analysis which the researcher undertook. The following chapter will analyse and discuss the findings of the study.

CHAPTER FIVE

ANALYSIS AND DISCUSSION OF FINDINGS

5.1 Introduction

This chapter analyses and discusses the findings of the study gathered through in-depth interviews and documentary analysis. The in-depth interviews were conducted at two Zimbabwean government hospitals situated in the capital city, Harare. The researcher interviewed fourteen healthcare professionals (HP) namely medical doctors, nurses, ICT managers and medical officers. The opening section of this chapter focuses on the perceptions of healthcare professionals (HP) on EMRs, followed by the highlights of the current state of EMRs adoption by the health institutions and will futher proceed to discuss the challenges hampering the adoption of EMRs. Lastly, the chapter will also examine solutions to the adoption challenges of EMRs.

5.2 Perceptions of healthcare professionals on EMRs

5.2.1 Awareness of the existence of EMRS technology

All of the respondents interviewed from both hospitals were aware of EMRs technology and they understood what is meant by Electronic Medical Records System. They all further highlighted that it involves archiving of patient records on computers, capturing of day to day operations, reporting, billing tasks, medical treatment and diagnostics. For example, one of the healthcare professional 2 (a nurse) stated that:

> *Yes, I am aware of EMR technology. We have it in use at this hospital. It's generally used to store patient records such as medical history and previous patient hospital visits.*

The above extract provides a good example that healthcare workers in Zimbabwean hospitals are aware of the EMR system, including its uses within hospitals. Eleven respondents stated that their awareness of EMRs technology was due to the fact that the system has been implemented mostly in private healthcare practices and in other

departments of their respective hospitals. Ohuabunwa et al. (2015) supports this by stating that the use of EMR is restricted within developing countries particularly in HIV management.

The study revealed that in Zimbabwe, healthcare facilities are at various levels of the adoption of EMRs. Four respondents mentioned fourteen other healthcare facilities that are making use of EMR technology to store patient records. However, the level of EMR adoption in these hospitals differed greatly, as some have been described by respondents as being better equipped as they have managed to emulate successful practices and greatly avoided pitfalls. Healthcare professional (HP) 3 and 5 (both ICT managers) explained:

> *As I mentioned before, we do have EMR systems running in specific departments of the hospital but the system yet fully implemented to include other departments and particularly when admitting patients.*

> *Comparing the current state of EMRs of this hospital with other healthcare institutions, specifically those that are privately owned healthcare, they do have properly functioning EMRs systems. The levels differ across the country as well, some hospitals do not have any EMRs systems.*

These disparities occur due to the fact that some of the hospitals are privately owned hence they have the sufficient funds to acquire EMRs technology. The use of EMRs technology in these hospitals have gained popularity and reckoned some of the best healthcare providers in Zimbabwe as compared to those who have not yet adopted EMRs. It was also noted that they have improved immensely in their healthcare delivery as compared to those using paper based methods and have gained revenue in the process. HP 6 (medical doctor) asserted that:

> *Patients are now aware of these new technologies, hence, they prefer more advanced (technologically) and dynamic hospitals than those using old, traditional methods.*

All respondents suggested that EMRs technology should be adopted and fully implemented, particularly by government-owned healthcare institutions as they are the

ones that are lagging behind. In a study by the UNDP (2014), it was found that a need exists for the state of EMRs to be standardised and modernised in the way they manage patient information. Due to the fast changing environment in technology, EMRs is needed to improve the quality of healthcare delivery in Zimbabwe. The system also helps to manage disease outbreaks and plan for future outbreaks through the observation of previous statistical data. Katsande (2015) believes EMR technology provides a faster and efficient way in day to day operations, as many patients are attended compared to the traditional way of keeping hospital records. As a result, healthcare workers are suggested that the government of Zimbabwe should embrace the change in technology and adopt EMRs within government hospitals. HP 11 (nurse) explained that:

> *The government should facilitate training, implementation and procurement of adequate equipment that can be used by various healthcare institutions around the country to successfully implement EMRs technology.*

Most of the respondents admit that the implementation of EMRs enhances the way healthcare workers perform their duties and explained how it improves quality of their work. EMR systems have been described as efficient in detecting errors, diagnosis, and communication among departments. HP 13 (nurse) stated that:

> *Since private-owned hospitals have begun the process of adopting EMRS, they have improved the time, doctors and nurses, spend treating patients as a result of less work involved with EMRs other than the pressure of hunting patient records.*

Ten healthcare professionals that were interviewed pointed out that EMRs in private healthcare institutions has enabled medical personnel to improve the total number of people treated. EMRs has also enhanced patient workflow as well as high productivity, unlike in public hospitals were paper-based methods dominate. EMRs have enabled

doctors to monitor and allow only the end user to have access to particular patient information. Ten health care professionals admitted that the use of EMRs in private hospitals has proved to reduce medical errors and makes communication easy between nurses and doctors. Paper-based methods involve bulky storage while EMRs saves space, time and workload because everything is done electronically. Through EMRs it is also easy to retrieve information from any point of the hospital, making the system more convenient than paper-based methods.

However, although healthcare professionals specified that they are aware and that their healthcare institutions have adopted EMRs technology, most of their information was still being archived on the paper-based system. This is because the system has not been fully implemented in most Zimbabwean healthcare institutions due to high cost and lack of proper infrastructure. As respondent HP 6 (medical doctor) states:

> *We do use and have a running system at our hospital of storing records in electronic format, particularly in the laboratory departments which obviously is a small part of the institution. Much of the data is being stored on paper files especially when admitting patients because recording information on an electronic device in a busy public hospital like this one is a daunting task.*

All healthcare professionals interviewed revealed that they were acquainted with at least one application of EMRs being used either at their respective medical institution or other institutions. EMRs applications that were acknowledged included E-clinic software, Digital Imaging System (DIS), Digital media display, Lab information management system (LIMS) and Trimmed System. As HP 7 (medical director) confirms:

> *Much of the data that we record in the laboratory like blood test results for instance is documented using a software called Lab Information Management System (LIMS).*
>
> *When recording patient information we usually use E-clinic software.*

5.2.2 Access to Information

The findings of the study show that all the respondents reported that EMRs technology has a benefit of improving access to information. This advantage permits healthcare professionals to access patient records without difficulty as compared to paper-based systems. Unlike paper documents, patient data stored electronically is effortlessly retrievable in its original format despite being stored for long periods. As HP9 (medical doctor) and HP 10 (medical director) explained:

> *This technology (EMRs) has allowed us to gain access to documents, results and historical patient information that would have taken ages to obtain if they were paper based. EMRs allows information to be access easily.*
>
> *The information that is provided by EMRs technology is not difficult to read and can be put in storage for a long time as compared to paper files which may be too old or torn while they are being stored.*

Katsande's (2015) established that EMRs provide correct, readable and well-organized documentation which allows patient information to be accessed and retrieved easily. The findings suggest that unlike paper-based systems EMR systems allows patient data to be easily accessible.

5.2.3 Benefits of EMRs technology

The findings of the study indicate that, the use of EMRs technology has four major benefits which are decision support, time improvements, financial improvements and access to information as shown in Figure 5.1.

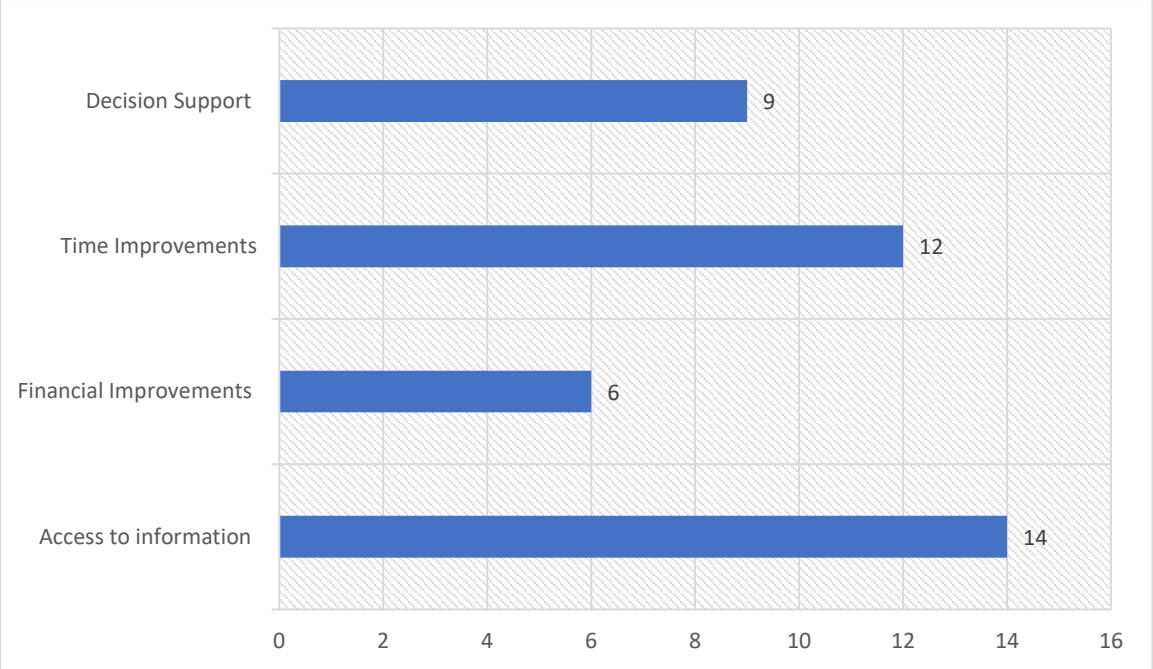

Figure 5.1: *Benefits of EMRs Technology*

5.2.3.1 Decision support

The study found that EMR systems assist healthcare professionals in making informed decisions when treating patients. Healthcare professionals indicated that medical practitioners through EMRs have access to patient data which aids in preventing avoidable accidents resulting from allergic reactions. HP 12 (nurse) explains:

> *Such a support system is very useful as it helps medical doctors to make decisions that wouldn't put the patient at risk, for example, some patients may forget prescriptions that they are allergic to, but with the EMR system, doctors can be informed of such details.*

A similar study by Meinert (2005) concluded that having access to an abundance of information allows unsafe drug-allergy interactions to be identified as soon as the physician selects medication on an electronic prescription pad. EMRs therefore have a benefit of access to information which assists medical practitioners in making proper and safe decisions when treating patients. Access to information represents one of the most important benefits of EMR technology, as it decreases preventable patient deaths that come about as a consequence of medical errors. According to Gerntholtz et al. (2007), more than 100 000 people die as a result of preventable medical errors

in the USA. EMRs therefore have a benefit of having a single repository of information which could easily highlight unsafe drug-allergy interactions

5.2.3.2 Financial Improvements

The results show that the two medical institutions in this study received some of their medical files electronically from other hospitals across the country, which was more economic as compared to shipping them. The study found that medical institutions would simply transmit the documents electronically which saves financially resources as opposed to physically send them. HP 11 (nurse) explained:

> *The use of EMR systems has provided this hospital with a positive benefit us to broadcast documents electronically which obviously saves a lot of money needed to transport the documents from one point to the other.*

EMRs thus play a major role in improving the revenue of healthcare organisations by averting unnecessary expenditure, as documents can be sent electronically to different location without the need to transport them. Sood et al. (2008) concurs by stating that networked EMR systems have the capability to allow laboratory data to be recorded and broadcasted from remote locations. This saves money needed for the transportation of paper based documents as they can be sent electronically **(**Meinert, 2005).

Furthermore, another advantage and probably the most important is that of increasing revenue of the healthcare institution by reducing money spent on unnecessary tests. The study found that the use of EMR systems at their medical institution avoided the need for unnecessary tests on patients to find a diagnosis. Medical personnel would simply access the patient's medical history within their database which saved money. HP 9 (medical doctor) pointed out that:

> *The EMR system is quite helpful in that you can easily access patient history which means there won't be any need for unnecessary tests to find out what patients are suffering from. The medical history will provide information about a patient's previous state of health.*

Sood et al. (2008) concurs by stating that EMR system benefits medical institutions by saving costs. In a study by Gerntholtz et al. (2007), it was concluded that in America,

EMR technology was believed to save the healthcare system approximately $336 billion in unnecessary expenses, whereas in Canada, it was estimated to save the government more than $1.3 billion.

5.2.3.3 Time Improvements

The use of EMR systems in healthcare institutions has an advantage of time improvements. HP 12 (nurse) noted that information can quickly move from one department to another and data is easy to retrieve, such as dates. This allows medical personnel to attend to patients faster without wasting much time looking for patient documents. HP 14 (medical director) revealed that:

> *Sometimes at the hospital it will be so busy that retrieving archived medical documents from the repository will be strenuous, but the use of EMRs makes it easier and faster to obtain patient documents*

This shows that EMRs have the advantage of reducing the time needed to obtain patient records as compared to the paper-based system. EMR systems enhance healthcare quality in giving more time for nurses and doctors to attend patients and there is increased confidentiality, only the end-user has access to patient files, leading to the information to be stored properly. Katsande (2015) states that in situations where medical personnel would have had to physically retrieve hard copy medical records, they are able to do this electronically with the use of EMR systems which saves valuable time.

5.3 Challenges hampering the adoption of EMRs

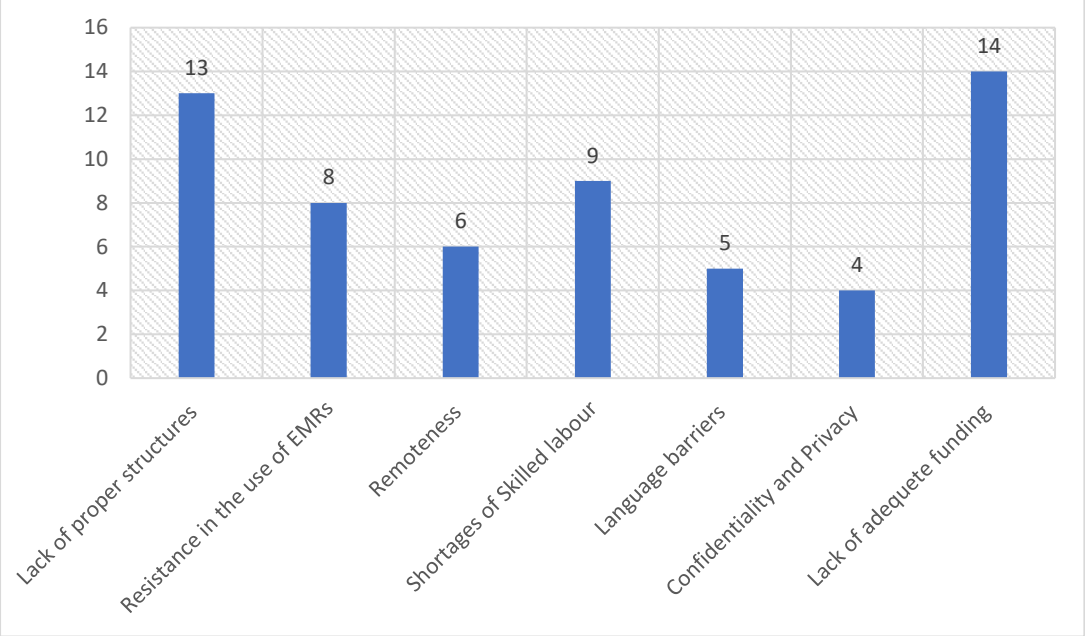

Figure 5.2: *Challenges hampering the adoption of EMRs*

5.3.1 Lack of proper ICT structures

The study found that the lack of proper infrastructures plays a role in hampering the adoption of EMR systems in Zimbabwean healthcare facilities. Most developing countries, in this case Zimbabwe, have poor infrastructures in place to support the development of EMRs technology. HP 3 (ICT manager) explained that:

> *It will be difficult to fully implement EMRs technology because our country doesn't have proper structures to support such a system, more especially in places like the rural areas where network access is low or not there at all.*

This provides clear evidence that Zimbabwe still lacks proper infrastructure for the development and implementation of EMRs technology. Sood et al. (2008) mentions that before the use of Information Technology (IT) based applications there is a need for appropriate IT infrastructure with an increase in the spread of wireless telecommunications. Prior to the application of EMR systems, there is a need for proper infrastructure such as a Local Area Network (LAN), servers, a database and the appropriate software (Boulus, 2010). However, in a study by Kleynhans (2011), it was concluded that infrastructures that support EMR are high-priced and can amount

to billions. These include hardware such as computers as well as electricity and wireless networks which have limited coverage in rural areas. In addition, the study found that Zimbabwe is in short of private IT vendors required to develop EMR systems and manage them for government hospitals. HP 5 (ICT manager) explains:

> *The IT sector in Zimbabwe lacks a number private IT companies who can compete to develop EMRs systems that are more efficient and affordable particularly to government hospitals and clinics.*

Other developing countries like South Africa have a number of IT vendors namely Medicom, Nootropics, Clinicom, Meditech and Unicare (Scholl et al., 2011).

5.3.2 Resistance in the use of EMRs

The study established that one of the main challenges hampering the development of EMRs technology is that of resistance from medical professionals. HP 12 (nurse) reported that:

> *I think health workers (nurses, medical doctors, hospital administrators) resist it (EMR systems) because they feel like computers are more complicated and demand more work unlike the paper based system where you just write and you archive the documents.*

The above extract shows that medical personnel resist the use of EMRs. Other respondents also revealed that some of their colleagues are computer illiterate and require training in order to use EMR based applications. Meinert (2005) contends that healthcare workers resist the use of EMR technology as a result of a number of influences including the well-publicized failures of EMR systems, computer illiteracy and patient satisfaction. Some healthcare workers believe the change from paper-based system to EMRs is a daunting challenge. Kleynhans (2011) argues that many medical practitioners may find it overwhelming to enter health records data into a computer. They are of the belief that EMR systems are time-consuming and disruptive from their everyday duties. They may make use of EMR technology however they would not entirely document things as they should, as they may prefer writing things on paper (O'Malley et al., 2010). Kleynhans (2011) supports this by stating that

medical staff would require a rigorous training course for medical practitioners to be more comfortable with the new technology.

5.3.3 Remoteness

The implementation of EMR technology in Zimbabwe has been hampered by the remoteness of some location. Some rural areas in Zimbabwe are too remote to allow EMR systems to be implemented. Most respondents mentioned that EMR technology in Zimbabwe is not developing due to the challenge of remoteness of the majority of the medical institution. The respondents alluded to the fact that challenges such as lack of electricity and limited network coverage affect the development of EMRs. Wright (2011) validates this by mentioning that remoteness and lack of electricity in some parts of the county hampers the overall coverage of EMR technology. These systems require computers and servers which need a continuous supply of power for them to function properly (Sood et al., 2008). Lober et.al (2008) adds by stating that some remote areas also face problems of inconsistent electricity supply which becomes one of main factors derailing the adoption and implementation of EMRs in less developed countries. One medical doctor (HP 9) stated that:

> *I think it's because most hospitals, especially those in rural areas do not have access to electricity or internet because they are located far from major cities. This problem makes it hard for government to implement EMR systems.*

5.3.4 Shortages in Skilled labour

A shortage in skilled labour was found to hamper the EMR systems development in Zimbabwean healthcare facilities. The study established that the country's poor

economy resulted in brain-drain due to the lack of better economic prospects in Zimbabwe for healthcare workers. HP 7 (medical director) explained that:

> *Here in Zimbabwe we are already facing shortages in the number nurses and medical doctors since most of them have migrated to other countries. The implementation of EMR technology may be hampered by this challenge.*

The economic difficulties facing Zimbabwe has severely affected the number of medical personnel in the country. Approximately 18,000 Zimbabwean nurses migrated and now work overseas (Sood et al., 2008). According to Sood et al. (2008), this causes a shortage of qualified workforce and lack of medical expertise in developing countries as competent medical and paramedical personnel leave their country in search of greener pastures. One can conclude that such a shortage of skilled labour can negatively affect the implementation of the EMR system in Zimbabwe.

5.3.5 Language barriers

Language is an important issue in considering the usage of EMR systems in countries that do not speak English as the native dialect. Sood et al. (2008) argues that it becomes difficult to facilitate interaction between divergent cultural subsystems which prevent the transfer of knowledge from one culture to another. Some of the respondents stated that language may play a role in the implementation of EMR technology. The majority of EMR systems are designed in English, and Zimbabwe has several different languages and dialects. Language therefore becomes an essential element for effectively implementing EMR systems in developing countries. The information presented in the users' native language, seems to be the most decisive factor for attracting website visitors (Sood et al., 2008).

5.3.6 Concerns of confidentiality and privacy

Issues regarding the privacy and confidentiality of patient information confidentiality are of paramount importance for both patients and medical personnel. The study found that patient personal information and medical data at the Zimbabwean hospitals understudy that were accessed by different medical personnel presented difficulties in ensuring privacy and confidentiality. Healthcare professionals expressed the need for

protecting patient data from being accessed by unauthorised individuals. The study found that there is a need for policies that regulate the access to patient information for healthcare personnel. HP 1 (ICT manager) explained that:

> *Not only are there proper infrastructures in place to implement EMRs, there aren't any laws in place to help protect people's personal information. I believe prior to the implementation of EMR systems, the issues of confidentiality and privacy need to be addressed.*

The implementation of EMR technology will only be successful if healthcare workers who have access to patient information understood the need to protect the patient's privacy and confidentiality. Personal information belonging to patients should never be disclosed to other individuals without their consent (Boulus, 2010). In Zimbabwe, there are a high number of individuals who are diagnosed with HIV/AIDS. The social stigma that is associated with the disease is prominent, which makes it important to address concerns of confidentiality and privacy before implementing EMR technology. According to Kleynhans (2011), the issue of patient profiles that disclose confidential information is emphasised and focuses on solutions that can be applied to ensure privacy of personal and medical data which is broadcasted to other medical institutions. Using EMR systems means that patient data will be easily accessible hence there has to be measures in place to ensure that this information does not end up in the wrong hands. It is therefore imperative that security measures should be put in place in order to ensure that access to patients` medical records is restricted only to authorised medical personnel. Hospital polices governing management systems of patients` files should be implemented to ensure confidentiality. Zimbabwe lacks the proper legislation in place to protect patient data, this creates another challenge that hampers the implementation of EMR systems in Zimbabwe.

5.3.7 Lack of adequate funding

One of the main concerns in the development and implementation of EMRs are the apparent high costs of computers and computer systems and limited finances (WHO, 2006). The study found that hospitals in Zimbabwe require proper IT infrastructure for EMRs technology to be implemented successfully however, a lack of funding is the main challenge. HP 5 (ICT manager) explained that:

I think Zimbabwe hasn't fully adopted the EMR system because it's very expensive to apply to hospitals. The computers and other components required need a lot of money to obtain and install.

Most, if not all government hospitals in Zimbabwe have little financial resources at their disposal and the money needed to upgrade or implement the EMR system may be impossible to obtain without the invention of the government. The government can play its part by designing programmes that support technology diffusion (Mamatela, 2014). Most developing countries, in particular Zimbabwe, have poor economies as compared to most developed counties. This makes it challenging for their governments to provide the necessary funds to implement EMRs technology in their healthcare institutions. EMRs are very expensive to implement and require considerable amounts of financial resources. Kleynhans (2011) argues that the infrastructure needed for the introduction of EMR technology would demand both time and funding so as to fit the needs of the country or institution.

5.3.8 EMRs can only be accessed online

Although the healthcare professionals interviewed for the study supported the adoption of EMRs, they also shared their concerns associated with the use of EMRs in hospital operations. The study established that the use of EMR systems has a possibility of being disrupted by network faults and breakdown or electricity cut offs. Accessing documents in such circumstances becomes difficult particularly during emergencies. HP 1 (ICT manager) asserted that:

The challenge associated with EMR systems is the fact that without the electricity or network, you won't be able to access any documents as compared to paper documents which are available in any situation.

EMRs require electricity and a proper network connection to access patient records. The absence of either of these two services would present problems for healthcare personnel treating patients. During a power failure or network unavailability, Akinyele et al. (2011) established that the access to control decisions cannot be made and documents cannot be accessed which may result in patient harm. Furthermore, the need for parallel data entry contributes to work overload which will be disastrous

particularly in situations where there is only a limited number of healthcare workers (Akanbi et al., 2011). Cresswell and Sheikh (2015) found that EMR systems frequently slow down the treatment of patients and therefore are regarded as less efficient, particularly the fact that they add more administrative tasks on the practitioner. Such disruptions to existing healthcare work practices bring about resistance of EMR technology by medical practitioners.

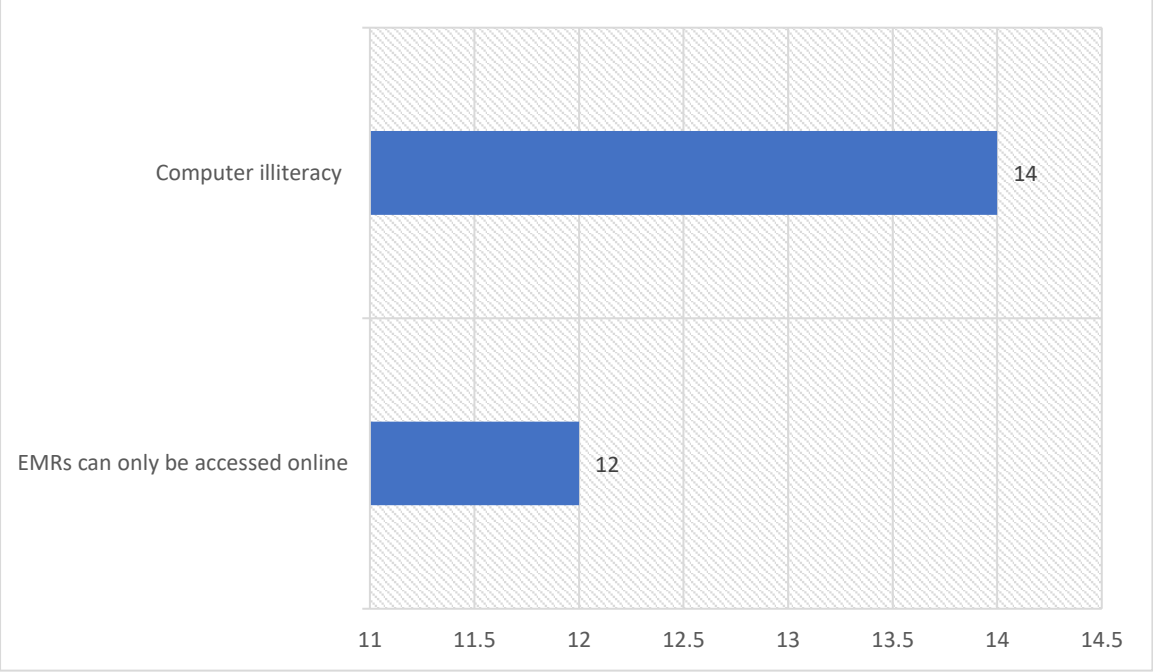

Figure 5.3: *Disadvantages of using EMRs technology*

5.3.9 Computer illiteracy

One of the biggest disadvantages of EMR systems is that of computer illiteracy. The study found that some healthcare professionals are unfamiliar with the use of computers or its complex software which makes it impossible to carry out their duties. HP 5 (ICT manager) explained that:

> *Using computer based applications and software requires a certain amount of computer literacy which I believe most healthcare workers do not possess. This makes it difficult to use EMR systems*.

The complexities of EMR systems present difficulties for healthcare professionals to use them which results in resistance. Kleynhans (2011) found that one of the main reasons for the resistance to change to EMR systems was related to computer illiteracy. Therefore, to successfully implement EMR systems in Zimbabwean healthcare facilities, there is a need for healthcare workers to undergo proper training courses so that they will be accustomed with the new technology.

5.4 Solutions to EMRs adoption challenges

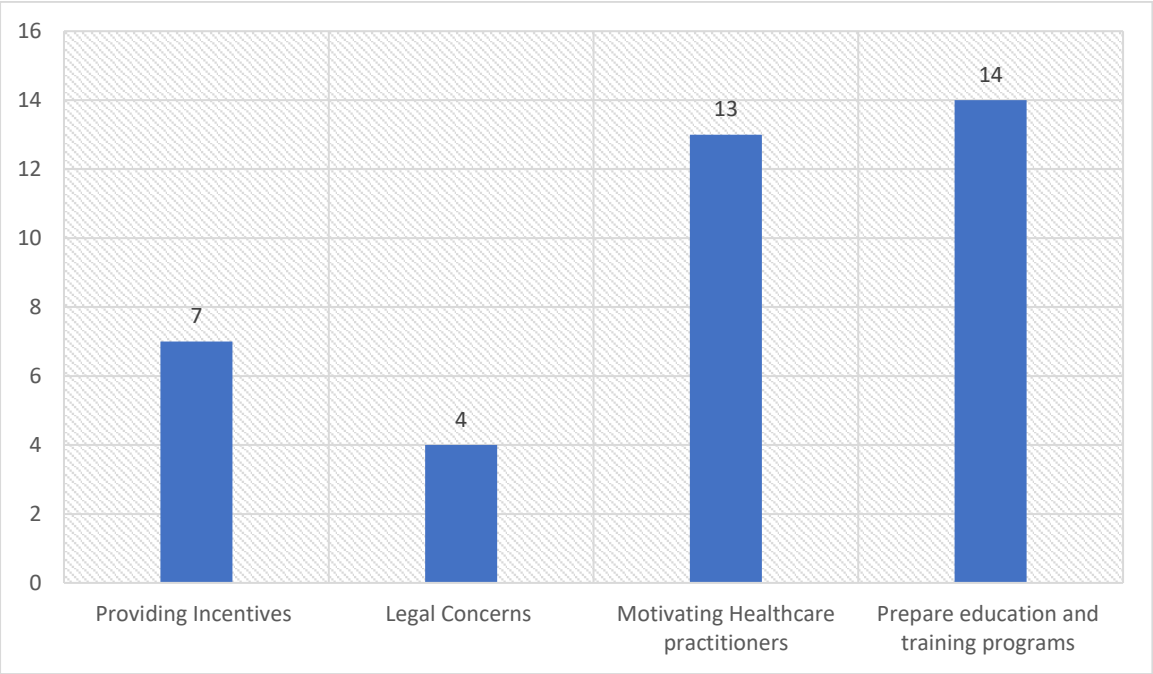

Figure 5.4: *Solutions to EMRs adoption challenges*

5.4.1 Providing incentives

The study found that the financial incentives or subsidies can be implemented as a measure to encourage healthcare institutions to adopt EMRs technology. For instance, respondents indicated that incentives from the government could assist in alleviating some of the challenges. HP 10 (medical director) explained:

> *I believe the public hospitals need support and incentives for them to fully adopt EMR systems, because without that I don't see any way they would simply adopt this technology on their own.*

According to Katsande (2014) some governments have started to provide incentives to encourage hospitals and clinics to employ EMR systems after realizing its potential benefits. Some studies have shown that the inclination to adopt EMR technology may arise from making healthcare systems more affordable through the provision of government incentives (Mamatela, 2014). Eight healthcare professionals that were interviewed stated that for EMR technology to develop faster and also increase its coverage there is need for government to support institutions willing to adopt such innovation. It is when governments drive the use of EMR systems by providing incentives as well as defining laws protecting EMRs users when regulatory disputes occur. The American government in 2009 provided roughly $17.2 billion in incentives for Healthcare institutions to implement EMR systems (Steiner, 2009).

5.4.2 Legal concerns

According to World Health Organisation (2006) legislation needs to be reviewed to incorporate the transition to the use of electronic medical records (EMRs) system. The study revealed that there is a need for proper legal structures in Zimbabwe that will protect patient personal information from being accessed by unauthorised individuals. HP 14 (medical director) explained that:

> *I think the government needs to address the legal issues that protect patient information that is the only way EMRs systems can be implemented without any problems and its users will also be assured that patient data is protected by the law.*

EMR technology can thrive when the legal environment supports its sustenance and implementation within healthcare institutions. The concerns regarding the privacy and confidentiality of patient data has to be guaranteed if advocates of EMR technology wants it to thrive in Zimbabwe. There is a need for legislation that will safeguard the privacy of the people's information without limiting proper transmission of data to other institutions (Sikhondze and Erasmus, 2016). Katsande (2014) concluded that legal frameworks should include retention schedules and how information is to be retrieved from electronic media on which it is stored.

5.4.3 Motivating healthcare practitioners

The study also found that motivating healthcare workers can be a good influence to ensure the successful implementation of EMR systems. 60% of the healthcare professionals interviewed expressed interest in the prospect of using computers in their administrative duties and indicated that they only need motivation to start. Healthcare practitioners need to be motivated to effectively utilise EMR technology at their institutions. According to WHO (2006) there is a need for development and implementation of change, and adoption framework to ensure effectiveness at a national, organizational or individual levels. Meinert (2005) believes it is critical to motivate healthcare personnel to take training courses. The healthcare workers selected for the training need to be motivated to learn in order improve their computer skills and this can be done through incentives such as a promotion to senior position within the medical facility (WHO, 2006).

5.4.4 Prepare education and training programs

Sood et al. (2008) states that one of the major pitfalls in the implementation of EMR systems can be identified as lack of consumer training. EMR development in Zimbabwe can only be successful with proper computer training of hospital staff. WHO (2006) states that there is need for a training team to develop education and training programs. On-site training is essential so as to address issues regarding work practice. Six respondents stated that there is need for proper education and training programmes before the full implementation of the EMR programme. Some of the respondents expressed concern that the EMR systems at their respective institutions are failing to develop because of lack of proper training.

According to WHO (2006) EMR technology in Africa has been known to be unsuccessful due to lack of such training and the limitation of understanding the system. It should also be noted that EMR education should be offered to medical stuff with more desire to learn the skills and will subsequently be used to encourage those who are not interested. Only a few respondents reported that for EMR use to develop in Zimbabwe, it should be compulsory for all medical institutions to implement such systems. Hier (2002) advocated that the usage of EMR technology should be mandated to all medical institutions.

5.5 Summary

This chapter sought to analyse data according to specific objectives of this study. The chapter analysed and discussed findings of the study conducted at two healthcare facilities located in Harare, Zimbabwe. In-depth interviews and documentary analysis were utilised to provide a deeper understanding for the implementation and adoption of EMR technology. The empirical findings discussed in this chapter suggest that EMR systems have a number of benefits which are key to improving healthcare service delivery to patients. The findings also suggest solutions that can be applied to successfully implement EMR systems in Zimbabwean healthcare enterprises. These solutions include the provision of incentives, motivating healthcare practitioners and preparing education and training programs which can be implemented as solutions in the adoption of EMRs technology in Zimbabwe.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This final chapter focuses on reviewing the significant findings of this research. The study aimed at exploring and explaining reasons for the lack of EMRs adoption amongst developing countries with a particular focus on Zimbabwe. In developing nations, the implementation and development of EMRs technology within public healthcare facilities has been minimal which leads to them not achieving the set developmental goals by the United Nations (UN) (Madore et al., 2015). Lack of adequate funding, resistance from healthcare workers, lack of proper infrastructure and shortages in skilled labour have been noted to be amongst other challenges, have been exposed by this study as hindering the development of EMRs in Zimbabwe. Correspondingly, other studies (Chebole, 2015; Cheung et al, 2015; Seale, 2015) established that similar challenges also plague EMRs development in low income countries. A study by McAlearney et al. (2015) discovered that 41% of government hospitals in America implemented EMR technology whereas developing countries only have a 4% adoption percentage. This is regardless of the several benefits that EMRs bring. The developing countries that have some of the most vulnerable populations should embrace and adopt EMRs in order to reap such benefits. Motivated by this need to have a profound understanding as to why there is lack of adoption of EMRs by primary healthcare institutions in developing countries, the study made use of the qualitative research approach. This method aimed at answering the following fundamental research questions posed by this research study:

1. What perceptions do healthcare professionals have on EMRs?
2. What is the current state of EMRs adoption by the primary healthcare institutions in Zimbabwe?
3. What are the challenges hampering the adoption of EMRs in Zimbabwe?
4. What solutions address the EMRs adoption challenges?

6.2 Summary of Findings

This section provides a summary of the main findings of the study. The study aimed at exploring and explaining reasons for the lack of EMRs adoption amongst developing countries with particular focus on Zimbabwe. This was done through in-depth interviews and documentary. The targeted population for this research were fourteen key staff members aware of patients' medical records management within the selected primary healthcare facilities. The findings of this research indicate that, EMRs technology is being used in Zimbabwean public hospitals although its use is limited as it is being used in HIV/AIDS management or in particular departments.

The study also found that healthcare personnel in Zimbabwean public hospitals are aware of the uses of EMR technology as well as its many benefits. The study reveals that although healthcare institutions in Zimbabwe have adopted EMRs technology, most of the patient information is still being archived on the paper-based system. Nonetheless, even though the application of the EMR system is limited in Zimbabwean hospitals, the study found that its benefits have been noticeable. EMR technology has made it easy to access information, averted redundant expenditure and has made time improvements. However, the study revealed that EMR systems come with their own shortcomings such as lack of access to patient documents due to network faults and the need for staff personnel familiarity with the use of computer systems.

In regard to the current state of EMRs adoption in healthcare institutions, the findings showed that EMR adoption in Zimbabwean hospitals differed greatly as private practices have managed to implement it successfully. The use of EMRs technology in these hospitals have gained popularity and reckoned some of the best healthcare providers in Zimbabwe as compared to those who have not yet adopted EMR technology. The study found that government hospitals have not fully embraced the use of EMR systems which affects their service delivery. The study confirms that the use of EMRs in private hospitals reduced medical errors and increased communication between medical personnel.

The results of the study also revealed that there are a number of challenges that hamper the development and implementation of EMRs technology in Zimbabwean public hospitals. These challenges include lack of proper infrastructures, resistance in the use of EMRs, remoteness, shortages in skilled labour and concerns of confidentiality and privacy of patient data. To ensure the successful development of EMRs technology, the study revealed solutions that can be put into effect. These solutions include providing incentives, addressing legal concerns, motivating healthcare practitioners and preparation of education and training programs in computer systems. The implications of these findings are discussed next.

6.3 Implications for practice and academia

This section discusses the implications of the study on two levels namely, implications for practice and for academia.

6.3.1 Implications for practice

This study will have positive implications for the practice of healthcare in Zimbabwe. The results of this study inform private stakeholders and the Ministry of Health and Child Care on solutions that can be adopted in order to create a conducive atmosphere for the development of EMRs technology. Patients and healthcare professionals need assurances that personal information belonging to patients will be protected by law and hospital policies. In Zimbabwe, there is need for legislation and appropriate hospital policies that ensure security, privacy and confidentiality of patient data. The use of EMR systems insinuates that patient data will be broadcasted wirelessly to other institutions which poses a risk of unauthorised data access. Moreover, there is need for healthcare institution policies that govern the access to patient information.

Additionally, the findings of this research will have positive implications on healthcare institutions practising in Zimbabwe. The results of the study can be utilized as a standard which permits private stakeholders and the Ministry of Health and Child Care to compare public institutions' technology adoption level to private hospitals that have fully embraced EMRs systems. This advises public healthcare practices that have not yet fully implemented EMRs that they are lagging behind with regard to the use of IT technology and also how much they will benefit from using this technology.

The study's findings can help enlighten healthcare practices on the requirements necessary to effectively implement EMRs systems. The most important resource they will need is that of a skilled labour force who will be able to operate the EMRs systems. Healthcare facilities will also need IT infrastructure such as broadband connections, servers, EMRs software and computers are important components required for EMRs adoption. Although such IT infrastructure is quite costly, they are vital for the function of EMRs systems.

6.3.2 Implications for Theory and Research

This study makes significant contributions to theory by presenting empirical evidence for existing theories and literature. A review of literature showed that there is a limited amount of studies of this nature in Zimbabwe. Hence, this study's findings will broaden our understanding on issues surrounding the adoption and implementation of EMRs technology in Zimbabwean hospitals. This study has shown Zimbabwean public healthcare facilities only make use of limited EMRs technology. The study found that specific healthcare departments that have implemented EMRs have proven them to be beneficial. These benefits include access to information, financial and time improvements. However, even though such benefits have been realised, the study found that the development and full scale implementation of EMR systems has been plagued by numerous challenges such as the lack of proper infrastructures, resistance in the use of EMRs, remoteness, shortages in skilled labour and concerns of confidentiality and privacy of patient data.

The findings of this study also some implications on theory. This study has extended theory by successfully integrating both the Technology-Organization-Environment (TOE) and the Diffusion of Innovations (DOI) theory. The two theories were found to be compatible and the resultant integrated model assisted in providing a better explanation to the adoption of EMRs. Furthermore, this study has implications on the Technology-Organization-Environment (TOE) theory since it validates the motivation to technology adoption and implementation of healthcare facilities is dependent environmental factors such as government legislation. In order for EMRs technology to be successfully implemented there is a need for laws that protect the privacy and confidentiality of patient data, which reinforces the faith and trust of patients and physicians in the EMR system. This is contrary to the Diffusion of Innovations (DOI) theory as it does not take consideration of the environmental factors where the organisation conducts business. In regards to supporting existing literature this study has added to the EMR context by proposing solutions to challenges that hamper the development and implementation of EMRs technology within Zimbabwean hospitals.

6.4 Limitations of Study

This section discusses the limitations of this study that ought to be recognised. Firstly; the study employed a systematic non-probabilistic sampling method to select respondents for the study. However, using this sampling method introduced a limitation for the study as it makes it difficult to generalise the results of the research. This is due to the fact that participants of the study were selected on the basis of their knowledge of EMR technology in Zimbabwe. Further research may extend to use probability sampling methods which will allow the findings to be generalisable to other healthcare institutions.

This study only focused on two institutions due to time constrains as well as limited funds. Consequently, the results of this study might not be generalisable to other institutions existing in a different environment. Additionally, the two healthcare facilities were located in Harare, the capital city of Zimbabwe. This may reduce generalisability of the results due to the lack of dispersion of the responses over a wider geographic area.

The study's findings may not be generalisable on other healthcare facilities located in other parts of Zimbabwe or rural areas. Further research may wish to conduct a similar study on other Zimbabwean healthcare institutions located in different parts of the country.

The sample size for this study was too small to obtain a data which can allow the researcher to make a non-biased conclusion. The researcher, as mentioned above, had limited time and funds to interview more respondents. The findings of this study might therefore not be generalisable due to a small sample size. A study with a larger sample size would have been ideal to obtain data which was reliable.

The study obtained data from healthcare professionals working at two public hospitals in Zimbabwe. It would have benefited the study if the researcher had included private hospitals in the study. This presents a limitation for the study since the results may not be generalisable to private healthcare facilities. Moreover, since most private hospitals were reported to be using EMRs technology, it would have been insightful to investigate the current state of EMRs at such hospitals. For that reason, subsequent studies may wish to extend and conduct a similar study on private hospitals or even do a comparative study with public hospitals.

6.5 Recommendations for future research

The preceding chapter discussed the limitations of the research study which offer opportunities for future research to cover the gaps left behind. As discussed earlier, this study only focused on public healthcare facilities in Zimbabwe. For that reason, prospective studies may wish to conduct a similar study on private hospitals. The conclusions from these studies may yield new knowledge regarding the state of EMRs technology in Zimbabwean private healthcare institution.

Future researchers may also wish to replicate this study at healthcare facilities in different geographic regions Zimbabwe. This study was conducted in Harare, the capital city of Zimbabwe, conducting similar studies in different contexts may offer a different perspective regarding the implementation and adoption of EMRs technology in Zimbabwean healthcare facilities.

Additionally, this research study utilised non-probabilistic sampling method to choose respondents for the in-depth interviews. Non-probability sampling methods have a disadvantage of producing data which cannot be generalised in different contexts. This opens up a gap for future research, through the use of probability sampling methods. Probability sampling methods will offer more reliable findings which can be generalisable to other healthcare institutions.

Lastly, as mentioned previously, the sample size for this study was too small to obtain a data which can allow the researcher to make non-biased conclusions. The researcher had limited time and funds to obtain a larger sample size. Future studies may wish to conduct studies that have a larger sample size to permit the findings to be generalizable. Studies with a larger sample size are likely to obtain data which is more credible.

6.6 Conclusion

This study has contributed to existing eHealth literature since little is known about the adoption and implementation of EMRs technology in Zimbabwe. The findings show that Electronic Medical Records systems have a number of benefits which are key in improving healthcare service delivery to patients.

The study combined the DOI theories to explain the adoption decisions based on factors that are related to the technology itself, for instance the users' perception about the technology. The model was useful in understanding EMRs challenges that hampered the development and implementation of EMR systems. The model also helped to realise the solutions that can be applied to successfully implement EMR systems in Zimbabwean healthcare enterprises. Consequently, providing incentives, motivating healthcare practitioners and preparing education and training programs can be applied as solutions in the adoption of EMRs technology in Zimbabwe.

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APPENDIX A: Permission to conduct research letter

Telephone: +263-4-798620
+263-04-702368
Telegraphic Address:
"MEDICUS", Harare
Fax: +263-4-720119/702293/
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ZIMBABWE

Reference: .....
Ministry of Health and Child Care
P O Box CY1122
Causeway
HARARE

19 May 2016

TO: All PMDs
Dr. P. Manangazira – Director EDC
Dr. P. Nyika Director M&E

REF: REQUEST TO CARRY OUT RESEARCH ON THE DEVELOPMENT AND IMPLEMENTATION OF HEALTH INFORMATION SYSTEMS IN THE MOHCC - RANGARIRAI MATAVIRE, ERIC ADU-GYAMFI, ALEXANDER PREMER AND TAURAI BRIAN MHEMBERE

Communication to do the above mentioned research is acknowledged.

The Ministry of Health and Child Care is in support of the above mentioned study. The study is conducted within the Health Information Systems Program (HISP). HISP is a global initiative to strengthen public health information systems and has been involved with the development and implementation of DHIS2 in Zimbabwe since 2012. During this period, a doctoral thesis and a masters dissertation have been completed. An Android-based system has also been developed through this initiative for the National Malaria Control Program and is being rolled out to a number of countries.

The researchers would like to be granted permission to interview health information personnel at the national, provincial, district and facility levels. This work dovetails with activities to support the rollout of the mobile phone based malaria pre-elimination system and to extend DHIS2 reach to the facility level.

The study benefits the ministry in terms of documenting the health information system and also given the action oriented approach used, the students will provide technical assistance to the development of the national information system.

Copies of the final results will be shared with the MoHCC.

SECRETARY FOR HEALTH & C/C
(PRINCIPAL DIRECTOR PREVENTIVE SERVICES)
19 MAY 2016
P.O. BOX CY 1122, CAUSEWAY
ZIMBABWE

Dr. G. Mhlanga
A/SECRETARY FOR HEALTH AND CHILD CARE

Cc; Dr R.F. Mudyiradima – Principal Director Policy, Planning and M&E

APPENDIX B: Research Participant Consent form

Department of Information Systems

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Tel: +27 (0) 21 650 2261 Fax: +27 (0) 21650 2280
Internet: http://www.commerce.uct.ac.za/informationsystems/

RESEARCH PARTICIPANT CONSENT FORM

Study Title:	***Lack of adoption of Electronic Medical Records Systems in developing countries: A case study of Zimbabwe***
Primary Researcher:	**Taurai Brian Mhembere**
Research Supervisor:	**Dr Salah Kabanda**

- **The researcher has explained the study to me in a language that I understand. The researcher has also answered the questions I had about the study and I understand what will happen during the interview and what is expected of me.**
- **I have been informed of my rights and that it is my right to refuse to participate in the interview. If I chose not to take part, I do not have to give a reason and I will not be prejudiced now and in the future.**
- **The researcher has affirmed that any information I provide will be completely confidential. My name nor any other information that can be used to identify me will not be used.**
- **It has been explained that at time researchers may use the respondents own words in the write up of the research. I have been informed that any use of my words will be anonymous and I have been informed that I can decide to permit my words to be used.**

I agree to take part in the study:	**Yes**	**No**
I agree that my own words may be used anonymously in the report	**Yes**	**No**

SIGNATURE OF PARTICIPANT:……

NAME (in capital letters)	SIGNATURE	DATE OF SIGNATURE

APPENDIX C: Interview Protocol with Interview Questions

PARTICIPANT ID CODE								
RESEARCHER INITIALS								
AUDIO FILE ID								
INTERVIEW NOTES FILE ID								
INTERVIEW DATE	D	D	M	M	Y	Y	Y	Y
INTERVIEW TIMES	START			END				
	:			:				
PARTICIPANT SUB-GROUP CODE	FAC / DPT CODE							

1. INTRODUCTION

Thank you for accepting to participate in this research study and taking the time out of your work schedule. My name is Taurai Brian Mhembere and I am a student at the University of Cape Town studying for a Master of Commerce majoring in Information systems.

ITEM	ACTION	DONE?
1.	Explain the purpose of the study to the participant	
2.	Delimit the aims of the interview and the anticipated duration.	
3.	Inform participant of other participants who are part of the study.	
4.	Explain why participant's participation is important.	
5.	Tell the participant what will happen with the collected information and how the target group will benefit from the study.	
6.	Remind the participant of their rights.	
7.	Find out if the participant has any questions.	
8.	Obtain consent from the participant before proceeding.	

Ice breakers questions to help the respondent to relax-work history

I would like to ask some questions related to your work and get to understand your role and experience.

- Job Title _____
- Number of years worked at the facility / department |__|__|yrs|__|__|mths
- Manage oversee or contribute the projects within your facility / department

2. RESEARCH INTERVIEW QUESTIONS

The researcher will proceed by asking questions relating to respondent's experience as a senior staff member within the medical facility relating to Electronic Medical Records Systems.

DOMAIN	TOPIC AND PROBES
Aware of the existence of the technology.	1. What is your understanding of Electronic Medical Records Systems? **Probes**: Do you think the way your patients' medical records are kept should be managed differently? 2. What advantages and disadvantages do you perceive in using EMRS as part of healthcare delivery? **Probes**: Do you think the Ministry of Health and Child Care are doing enough to enhance your medical records management practices?
Perception of institutional EMRS Adoption.	1. In your opinion, do you think EMRS adoption can enhance the way you perform your duties now and how? 2. Why do you think healthcare institutions should or should not adopt EMRS? **Probes**: What else do you feel the Ministry of Health do? 3. What do you feel is senior leadership's role in ensuring that the patients' medical records are properly managed? 4. Would you consider EMRS as a solution to managing patients' medical records over paper based methods?
Knowledge.	1. Are you aware of any other medical facilities, public or private who are using EMRS? **Prompt**: What has been their experiences and what have they gained from using such? 2. Who are the people or what role/s within the institution are responsible for selecting appropriate technology on behalf of the entire institution? Prompt: Why the chosen individuals? Probe: What role will you play in the selection of these technologies? 3. Are you aware of any specific EMRS applications? Prompt: Are they suitable for organisations such as here?
EMRS concerns-Technological context	From your understanding, what are the challenges you feel need to be addressed by the MoHCC for effective EMR adoption? Probe: Relative advantage concerns? Probe: Institutional complexity concerns? Probe: Technology compatibility? Probe: Solutions to the challenges?

EMRS concerns-Organisational context	The MoHCC is the regulator and director of all medical facilities in the country thereby making it a complex organisation. From this set up, and from your organisational experience, please comment on the EMRS adoption concerns you may have from an organisational perspective. Probe: The need for top management support? Probe: The impact of firm size and complexity? Probe: technology readiness?
EMRS concerns-Environmental context	The healthcare delivery environment is constantly changing and complex given the fact that you deal with several epidemics and outbreaks, from your experience, what do you perceive as the environmental factors outside the healthcare facilities that may influence the adoption of a nationwide EMRS? Probe: Government bureaucracy? Probe: Private sector competitiveness, how private healthcare institutions are managing their EMRS? Probe: Infrastructure availability? Probe: Other ministerial support?

4. CLOSING

Is there anything else you think is important to discuss regarding Electronic Medical Records Systems adoption practices at the medical facility?

Complete closing actions:

1. Summarise the interview
2. Thank participant for taking part in the study
3. Give the participant a handout containing additional information and contact details.

APPENDIX D: Language Editing Certificate

11 Leather Oak Street

Villa Bianco

Oakglen, Bellville

Cape Town

7535

The Faculty of Commerce

Department of Information Systems

University of Cape Town

Rondebosch, Cape Town

7700

RE: Confirmation of copy-editing of research *paper* ***"Lack of Adoption of Electronic Medical Records Systems In Developing Countries: A Case Study of Zimbabwe"*** by Taurai Brian Mhembere (MHMTAU002)

To whom it may concern.

This is to confirm that the above mentioned research thesis was submitted for copy-editing. The thesis was checked for the following: spelling consistency; grammar usage and style; punctuation; quotes and sources; and the structural flow of an academic paper including coherent numbering.

The research paper was edited by Musanathi Mosweni, a freelance copy-editor and a full time Communication and Language Practitioner for MMI Holdings.

In no way did the copy-editor make changes or edit any part of the research content, or methodologies thereof. All language changes that were made by the copy-editor were in the track changes format and were implemented in consultation with the author of the research paper, and a summary of the changes made was submitted to the author.

Signed

Musa Mosweni

Date 22 July 2019

SUID AFRIKAANSE POLISIEDIENS
STATION COMMANDER
22 JUL 2019

Bellville at 2019/07/22 at 08:20

7209936-4

(HANDTEKENING) KOMMISSARIS VAN EDE
(SIGNATURE) COMMISSIONER OF OATHS

Keanu Stergianos

VOLLE VOORNAME EN VAN DRUKSKRIF
FULL FIRST NAMES AND SURNAME IN BLOCK LETTERS

Voortrekker Rd, Bonton,

BESIGHEIDSADRES (STRAATADRES)

APPENDIX E: Ethical clearance certificate

Faculty of Commerce

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26th April 2017

Mr Taurai Brian Mhembere
Department of Information Systems
University of Cape Town

Dear Ms Fredericks

REF: REC 2017/004/026

ADOPTION OF ELECTRONIC MEDICAL RECORDS SYSTEMS IN DEVELOPING COUNTRIES-A CASE STUDY OF ZIMBABWE

We are pleased to inform you that your ethics application has been approved. Unless otherwise specified this ethical clearance is valid for 1 year and may be renewed upon application.

Please be aware that you need to notify the Ethics Committee immediately should any aspect of your study regarding the engagement with participants as approved in this application, change. This may include aspects such as changes to the research design, questionnaires, or choice of participants.

The ongoing ethical conduct throughout the duration of the study remains the responsibility of the principal investigator.

We wish you well for your research.

Shandre Swain
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